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THE IRON AGE

New York, January 3, 1929

ESTABLISHED 1855 VOL. 123, No. 1

Steel Industry Will Be Well Satisfied if 1929 Maintains the Volume and the Market Stability That Have Made 1928 a Wonderful Year

¶ *Giving repeated surprises in the volume and wide scope of demand,* 1928 *made a new peak in steel. Its ingot output of* 50,400,000 *tons was nearly* 3,500,000 *tons above that of* 1926, *which had been the record year.*

¶ *Reversing the movement of* 1927, *prices advanced, though unevenly. In bars, shapes and plates, which together are over* 40 *per cent of the total output, the average price at the year end was about* $3 *a ton above that at the opening.*

¶ *Each quarter saw a definite effort of producers to lift the market—with better success in the heavier than in the lighter products. Earnings improved, but owing to the large carry-over of low-priced tonnage from* 1927 *most of the betterment was in the second half-year.*

¶ *No year since the war has had so well sustained operation of mills. Summer output kept up remarkably. The year's earnings owe much to the lowered peaks and raised valleys of the production curve.*

¶ *In pig iron, after the decline of* $2.50 *a ton in* 1927, *there was little room for more, but the market kept sagging until mid-August, when* THE IRON AGE *composite was* $17.04 (*the lowest since November,* 1915) *against* $17.54 *on Jan.* 1. *Under large buying in August and later, prices rallied, and in December were* $1.50 *above the low. Output was* 38,000,000 *tons; for* 1927 *it was* 36,566,000 *tons.*

IN its forecast of 1928 as a steel year THE IRON AGE said in the issue of Jan. 5 that it was expected to compensate for some of the recession of 1927. And 1928 met that expectation and more. It goes down as an *annus mirabilis* in the American steel industry—wonderful in its high production peak, in the stability of the market under increased output, in a steadiness of demand which permitted an unusually uniform and thus more economical operation of mills, and finally in the almost unprecedented scale of steel output in the summer months. Rated in figures, 1928 was an 86 per cent production year, while 1927 was a 75 per cent year and 1926 an 81 per cent year.

For the greater part of the year the industry showed a degree of prosperity that distinguished it from most others, causing repeated references in business reviews to its exceptional position. In that connection mention should not be omitted of the fact that 1928 made a new record in steel output in spite of a poor railroad demand; but in that respect it simply emphasized what has been seen in other recent years of the growth of steel uses in a constantly widening circle.

Promise for the New Year

Entering 1929 the steel trade looks for a continuance of large-scale demand. December production has been beyond expectation and business in sight points to an active four months. In none of the lines of consumption that have made heavy demands upon the mills in the past year is any falling off now indicated apart from construction. The railroads may make up for any decline there, seeing that for four consecutive years their equipment purchases have been disappointing. In the late weeks of 1928 car

orders and car-building programs came out in the way that many had looked in vain to see in pre-election months.

The compensation of 1928 for the shortcomings of 1927 as a steel year was notable in the automobile industry, which took 18 per cent of last year's output, whereas its highest previous percentage was 14.5 in 1926. In view of that high record and of the way the steel industry has of halting or receding somewhat after a new peak, there is little expectation that 1929 will exceed the year just ended.

Steel Demand More Uniform

One factor in steel producers' expectations of 1929 is the confirmation the past year has given to the belief that the industry has been outgrowing old habits; that steel has taken such a place in modern life that, barring panics and calamities of nature, demand for it will be well sustained under ordinary conditions. At the same time the conviction has grown that to further guard against the old-time fluctuations there must be concerted effort by steel makers to extend the uses of their products, to study what they and their customers can do to increase the demand for the manufactures of the latter. President Schwab and Director George M. Verity both broached this subject at the October meeting of the American Iron and Steel Institute. More steel producers than formerly are alert to the possibilities of such effort, and that fact is one of the grounds for optimism regarding 1929.

Price Changes Much to the Fore

A feature of 1928 that distinguishes it in iron and steel market annals is the large part taken by price advances and attempted advances. In no year since the "feast and famine" régime in steel, when booms brought many advances and depressions brought many declines, have the market summaries of THE IRON AGE revolved to such an extent about the price factor. Producers set out to get prices with a profit in them, after much of the other sort of experience in 1927. The expedient most resorted to, and one that in former times was now and then used to good effect, was the announcement of an advance and then the free booking of immediate business at the price previously prevailing, or putting a time limit on the receipt of specifications on lower-priced business.

There was varying success in getting prices up in this way. Producers were helped more than they expected, in their efforts to mend the market, by the way in which demand held up. The psychological effect of giving out that for a coming quarter prices would be $2 a ton higher is heightened when the buyer finds that other consuming lines than his own are taking steel freely. That is quite different from a situation in which steel production goes up because sellers are pushing output to get cost down so as to undersell a competitor.

ADVANCES IN THE "BIG THREE" PRODUCTS

Interest naturally was greatest in the advances in plates, shapes and bars. They are widely used, and together have made up 40 to 42 per cent of the total output of rolled steel in the past half dozen years. Commonly they sell at the same price, though bars at times bring more than the other two, and if there is any weakness it is more pronounced in plates, as plate capacity is overbuilt. At the opening of the year the market for the three products was 1.75c to 1.80c, the latter price having been announced by the Carnegie Steel Co. on Nov. 10, 1927. Each quarter saw a new and higher price. Together the advances announced totaled $5 a ton and the net obtained was about $3 a ton.

UPS AND DOWNS IN SHEETS

Sheets also were conspicuous in the price comment of the year. There had been a sagging market in most of 1927, and at its close 2.80c was the common basis for No. 24 black sheets. In early February automobile body sheets were advanced to a 4.15c base, or by $3 a ton. Fender stock strips also went up $3. On black sheets 2.90c became the minimum of a good many mills. March showed a weakening. In early April 2.80c was done and by the middle of the month 2.75c. Business fell off in April and further declined in May, and prices suffered. In June, at 2.65c for No. 24, the market was lower than at any time since March, 1916. In the fall 2.75c was established and in early December 2.85c was announced by a number of mills as the basis for the first quarter business. A notable change in the sheet trade was the reduction from 2 per cent to ½ per cent in the discount allowed by the mills for payment in 10 days. The new discount, though protested by many buyers, became effective Oct. 1.

The large call for sheets from the automobile industry, as well as from agricultural implement works, made 1928 an unusual sheet year. Output was close to that of the record year 1916, exceeding that of both 1923 and 1926, which came next to the war year. The prophesied inroad of wide strips upon the sheet trade has not been realized. Strip competition has had more effect on sheet prices than on tonnage.

WIRE, PIPE AND OTHER PRODUCTS

Wire prices showed no little irregularity. In March it appeared that distributers of nails were underselling the mills, which in late 1927 had raised prices and revised extras. In the second quarter there was a widening spread in quotations by different producers of 10c. or more a keg below the $2.65 basis at the opening of the year. In August demand picked up and wire plants operated at 65 per cent, the highest rate in months. In December wire mill prices were advanced $4 a ton to buyers other than jobbers and a new schedule was introduced which makes jobbers' prices $2 a ton less than those of other carload buyers.

In merchant pipe the market was subject to more weakness and price variation than in the previous year, but the only formal change came in April, when the National Tube Co. withdrew the extra discount of 5 per cent which was made effective Oct. 1, 1927.

Strip prices were advanced in the first quarter $1 to $2 a ton. In March some cold-rolled strip mills got as high as $3 a ton more on current business than the December, 1927, basis for early 1928 delivery. In May, as sheets weakened, hot-rolled strips declined $1 to $2 a ton. In November large buyers of hot-rolled placed first quarter contracts at concessions, though previously new bases and extras had been adopted representing $3 to $5 a ton advance from third quarter prices. Cold-rolled strips were established about the same time at 2.85c., Cleveland and Pittsburgh, but buyers covered before the $2 advance.

Cold-finished bars and shafting, after some shifting in the first and second quarters, were advanced $2 a ton in August, restoring the base of 2.20c., Pittsburgh.

Full Demand, Widely Distributed

As indicated in an introductory paragraph, the breadth of the demand for steel and the way in which it held up from month to month, especially in the summer, exceeded the most optimistic estimates at the year's opening. Railroad and oil tonnages were not satisfactory. But the building volume was remarkable, the year being notable for the number of large contracts for structural steel. The total of fabricating contracts closed in the 11 months was 3,041,250 tons, which compares with 2,805,000 tons in 1927 to Nov. 30. Estimating December, the year showed approximately 3,250,000 tons, or 6 per cent above the high record of 3,060,000 tons in 1927. Business in

reinforcing bars was considerably greater than in 1927 and also went quite beyond that of 1926.

Frequently in the market reviews of the year the large steel orders from agricultural implement works were mentioned as one of the compensations for the restricted buying by railroads. It was probably the best year the steel industry has known for that trade, and with legislation in the making that is expected to add materially to the farmer's buying power, the consumption of steel in farm equipment should be large in 1929.

CHANGES IN THE PIPE TRADE

Pipe mills fared badly, the oil industry, in spite of large orders for pipe lines and oil storage tanks, making even smaller demands upon the steel companies than in 1927. For a considerable period mills supplying the oil country trade ran at about 60 per cent of capacity. Probably no year has seen so many line-pipe contracts of large size. The total of those made public was 756,000 tons and the aggregate probably ran close to 1,000,000 tons. A notable feature of this business was the large amount of electrically welded pipe. Three orders for this product were for more than 100,000 tons each. In diameters of 12 in. and larger it seems to have taken a permanent place in the pipe field. The speed of the process permits of outputs several times those possible in furnace lap-welding.

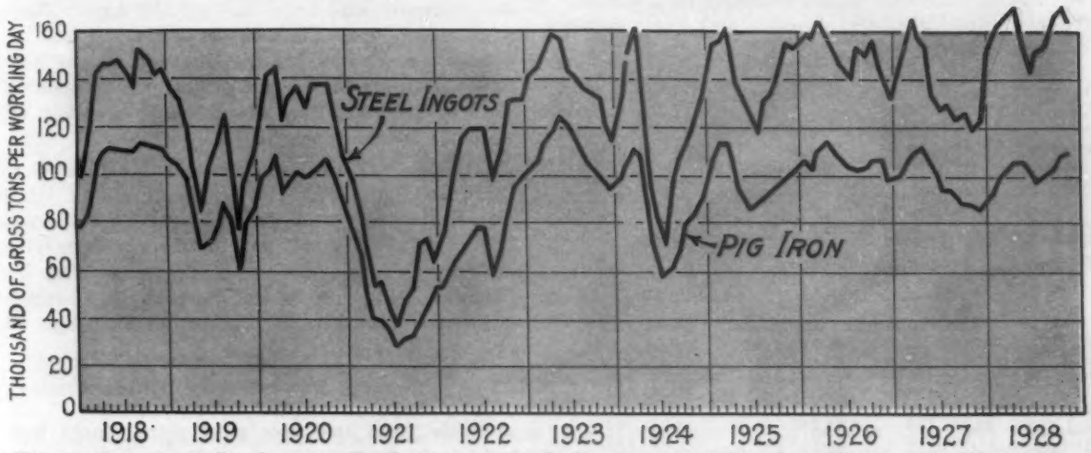
Another development of the year was the increasing volume of orders for seamless pipe for oil lines and for oil well drilling, to the displacement of the lap-welded product, indicating a closer approximation than heretofore in the production costs of the two products.

More marked than in previous years was the lessened demand for wire nails. Productive capacity is evidently more than twice as great as is needed for present-day requirements, since paper cartons have displaced wooden boxes for so many uses.

AN ACTIVE YEAR IN SHEETS

The prosperity of the automobile builders and the exceptional activity of manufacturers of agricultural machinery did much for the producers of sheets. Likewise it was a great year in tin plate owing to the exceptional pack of canneries. The sheet output made a new record by a wide margin, or close to 5,000,000 tons, against 4,565,000 tons, the production of 1926, the previous high record. It appears that the combined sheet and tin plate production of 1928 also made a new record. Not alone did the automobile industry take more sheets than ever, partly because the average per car has increased, but the sheet mills have profited increasingly by their propaganda work of recent years to extend the use of their product in both new and old fields. In this respect the sheet manufacturers have set an example that may well be followed in other steel lines.

For the greater part of the year the National Association of Sheet and Tin Plate Manufacturers (now a part of the National Association of Flat Rolled Steel Manufacturers) showed production running well up to capacity. In March, September and October it was slightly above rated capacity. Unfilled orders, which were 745,000 tons at the beginning of the year, ranged from 500,000 to 550,000 tons after the first quarter and were 565,000 tons at the end of November.



Fluctuations in Daily Average Production of Steel Ingots and of Pig Iron, During the Past Eleven Years. While generally parallel, the curves are farther apart than formerly, much farther than in 1921, *for instance. They are based on monthly ingot figures of the American Iron and Steel Institute and monthly pig iron figures gathered by* THE IRON AGE. *Ingots have gone into new heights, far above the great record of* 1926. *Pig iron is* 2.6 *per cent above the average of the five years* 1923-1927

RAILROAD BUYING DISAPPOINTING

Capital expenditures by the railroads for new equipment and additions and betterments totaled $650,000,000 against $771,552,000 in 1927, and that year was about 15 per cent below 1926. The amount devoted to new equipment in 1928 was $215,000,000 compared with $288,700,000 in 1927, a decrease of $73,700,000, or 25.5 per cent.

The number of freight cars ordered for domestic railroad service in the past year was 51,200, a decline of about 20,800 from the previous year. Locomotive sales for domestic service also suffered, totaling only 503, against 734 the year before. The railroads in 1928 installed in service 57,582 freight cars and 1333 locomotives compared with 75,386 freight cars and 1955 locomotives in 1927.

More specific reference to steel demand in 1928 in important lines of consumption is made in articles on other pages covering construction, railroads, and the oil and automobile fields. The automobile percentage of the total steel output (18), as indicated graphically in the columnar exhibit on pages 8 and 9, was the highest on record, the estimated output of motor cars and trucks being 4,380,000, comparing with 3,393,887 in 1927 and 4,298,759 in 1926.

Unparalleled Outpouring of Steel

Steel production last year, as shown in the heavy black curve above, has no parallel in any of the post-war years

shown on the graph. The 1928 ingot output was not only remarkable for its record size, but also for exceeding by an unprecedented amount the output of pig iron. As against about 7,500,000 tons as the largest gap between the two in other years, the difference last year was about 12,400,000 tons, indicating the use of scrap in steel making on a scale never before known.

We estimate the 1928 production of steel ingots at 50,400,000 tons and that of steel castings at 1,250,000 tons (against 44,935,000 tons in 1927), making the 1928 total of ingots and castings about 51,650,000 tons.

The high rate of steel production in the summer months is a noteworthy feature of the ingot curve. The March, 1927, output of ingots was an outstanding record until October of last year, when a new peak was reached at 4,647,891 tons. This is about half the entire twelve months' output of Great Britain in a good year.

In the following table is given the production of ingots month by month, according to the statistics of the American Iron and Steel Institute. crucible and electric steel ingots being excluded:

Months 1928	Daily Ingot Production, Gross Tons	Months 1928	Daily Ingot Production, Gross Tons
January	153,513	July	152,463
February	161,812	August	154,759
March	166,945	September	165,903
April	172,103	October	172,144
May	155,674	November	163,822
June	143,960	December	.....

Outputs of steel ingots and pig iron are given below for 1928 and the preceding 10 years:

	Pig Iron, Gross Tons	Steel Ingots, Gross Tons	Steel Ingots and Castings, Gross Tons
1918.....	39,054,644	43,051,022	44,462,432
1919.....	31,015,364	33,694,795	34,671,232
1920.....	36,925,987	40,881,392	42,132,934
1921.....	16,688,126	19,224,084	19,783,797
1922.....	27,219,904	34,568,418	35,602,926
1923.....	40,361,146	43,485,665	44,943,696
1924.....	31,405,790	36,811,157	37,931,939
1925.....	36,700,566	44,140,738	45,393,524
1926.....	39,372,729	46,936,205	48,293,763
1927.....	36,565,645	43,776,717	44,935,185
1928 (est.).	38,000,000	50,400,000	51,350,000

Lowest Pig Iron Price Since 1915

Pig iron made some unique records in 1928. Its total production of about 38,000,000 tons (including charcoal iron, ferromanganese and spiegeleisen) was the sixth in size in the history of the industry, despite a first quarter output which was the smallest for any first quarter since 1922.

In no month except the first two did the output fall below 3,000,000 tons. The midsummer production was exceptionally high, and the tapering off at the end of the year was less pronounced than usual, an evidence of which was the fact that the November daily output was the highest for any month since April, 1927, and was the largest in any November since 1918.

In only five previous years was the 1928 production exceeded, and three of these were the war years of 1916, 1917 and 1918. Last year's total compares with 40,361,146 tons, the all-time record of 1923, and fell only about 1,400,000 tons below the next highest yearly production, in 1916.

Prices in mid-year went to the lowest since 1915, but recovered in the late months to a point higher than any since the first half of 1927. THE IRON AGE composite average for July, 1928, was $17.10 (the low week being $17.04), declining from $17.73 in February and March, ascending slightly in August and at a more accelerated pace in the succeeding months, reaching $18.59 in December, which was the year's peak. However, the composite average for the year, at $17.67, was the lowest for any year since 1915.

TWENTY-THREE FURNACES ABANDONED

Another development of the year was the large number of obsolete or uneconomical furnaces scrapped. Twenty-three were taken off the list, many of them sold to scrap dealers. With a gain of only two new furnaces, the net loss for the year was 21, bringing the total of furnaces on the potentially "active" list to 336 against 357 a year ago.

Present output is being achieved with a much smaller number of furnaces than a few years ago. For example, in 1926, a year of almost record-breaking production, the number of furnaces in blast never fell below 213 and reached a maximum of 237, while in 1928, with a production only about 1,400,000 tons smaller, the total of furnaces in blast never was more than 198 and ranged from that figure down to 169.

The explanation, of course, is the greater capacity of most of the furnaces now in use. The daily rate per furnace in 1926, taking those active on the first day each month, ranged from 460 to 497 tons; in 1927 the range was from 484 to 516 tons, while in 1928 the daily rate per furnace was from 515 to 560 tons. These figures demonstrate that the small-capacity furnace in pig iron production is no longer in the race. Of the 336 furnaces now remaining on the active list of THE IRON AGE, more than 50 are considered obsolete and probably will not be operated again except in emergency.

Of the 23 furnaces abandoned in 1928, 15 were merchant and eight were steel company stacks. Eight of the merchant furnaces were in the eastern Pennsylvania district, two in Virginia, two in western Pennsylvania, two in Tennessee and one in Chicago. Of the steel plant furnaces, two were in Buffalo, two in Youngstown, one in eastern Pennsylvania, one in the Shenango Valley and two in Alabama.

LITTLE NEW FURNACE CONSTRUCTION

Aside from two new steel plant stacks and the rebuilding to larger size of a merchant furnace, all in the Chicago district, no new blast furnace construction is at present contemplated. The two new furnaces added to the list in 1928 were the Fairfield stacks of the Tennessee Coal, Iron & Railroad Co. at Fairfield, Ala., with a rated capacity of 440,000 tons annually. The Hamilton furnace of the Hamilton Coke & Iron Co., Hamilton, Ohio, was rebuilt and enlarged to serve the plant of the American Rolling Mill Co. at Middletown, Ohio, with hot metal. The Neville Island furnace of the United States Steel Corporation was sold in September to the Davison Coke & Iron Co. and will be operated as a merchant producer.

An accompanying table gives the number and daily rate of furnaces in blast at the beginning of each month. The largest number was 198 on June 1, with a daily rate of 104,015 tons, and the smallest, 169, on Jan. 1, with a daily rate of 86,835 tons:

1928	Number in Blast	Daily Rate, Gross Tons	1928	Number in Blast	Daily Rate, Gross Tons
Jan. 1...	169	86,835	July 1...	189	100,855
Feb. 1...	185	96,640	Aug. 1...	185	98,445
Mar. 1...	187	100,060	Sept. 1...	185	98,730
Apr. 1...	197	103,215	Oct. 1...	197	106,755
May 1...	195	106,145	Nov. 1...	197	108,800
June 1...	198	104,015	Dec. 1...	194	108,575

In merchant iron sales, the year made a poor start. Competition was keen among merchant producers in adjacent districts, and during a considerable part of the year steel producers with surplus iron disposed of it at prices which many merchant competitors could not meet. This situation was pronounced in the late spring. The growing dominance of steel company iron in the Valley district was shown by a sale in June of a large tonnage of basic iron at a drop of 65c. a ton, bringing the price down to $15.35, furnace, the lowest since 1915. Later in the year, the steel companies in Pittsburgh and the Valleys virtually withdrew from the pig iron market to conserve metal for steel manufacture, and it was in this period that pig iron prices made their greatest re-

covery, not only in those districts but in all sections of the country.

FURNACES WENT FAR AFIELD

Furnaces in nearly all districts reached out for more distributing territory, thereby adding to price demoralization in the first half of the year. Buffalo furnaces invaded the eastern Pennsylvania district; Cleveland producers sold iron in the Cincinnati district in competition with Alabama, Tennessee and Ironton, Ohio, makers, and Lake Erie iron, shipped by boat, was sold in Chicago and other Lake Michigan ports.

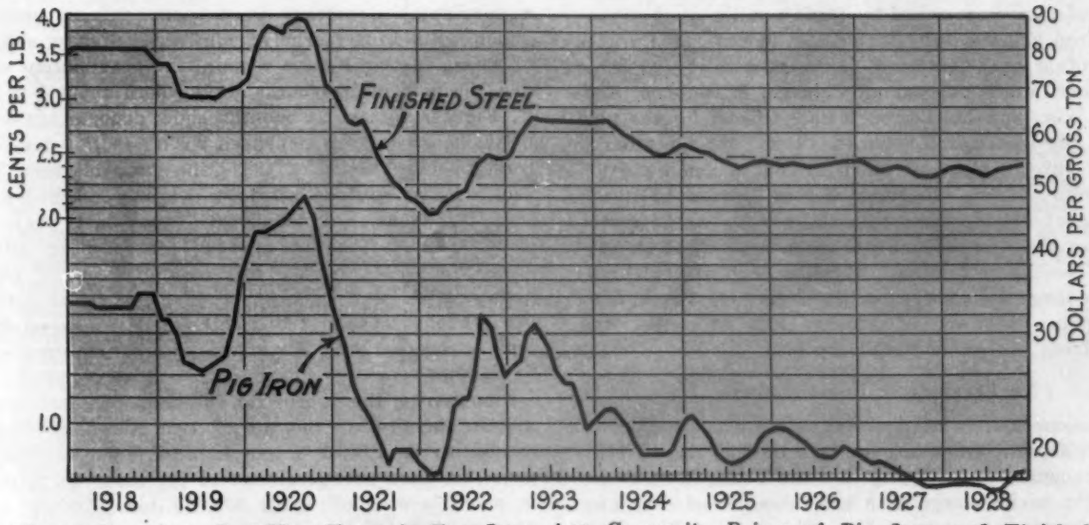
Water shipments increased. The movement from Buffalo by New York State barge canal to New England and to the New York City district amounted to 122,456 tons in the season. Boat shipments from Lake Erie furnaces to Chicago totaled 25,000 tons and those to Milwaukee were about 15,000, and in addition six cargoes were unloaded at Muskegon, Mich.

Pig iron imports, which declined considerably in 1927 from the preceding years, may have increased slightly in 1928, the total for the eleven months amounting to 129,819 tons, compared with 133,068 tons in 1927 and 445,773 tons in 1926. Low prices in this country and higher prices abroad were responsible in large measure for the decline in the past two years, though to a less degree the 50 per cent increase in the tariff, which went into effect in 1927, and the anti-dumping duty assessed against German pig iron and only recently revoked, influenced the downward trend. An unusual feature of the import movement was the receipt at Chicago of English hematite iron, brought by boat across the ocean and through the Great Lakes.

Scrap Recovered From Early Depression

Scrap prices during most of the year were at a low level, and the supply in the first eight months seemed ample for all requirements. In August and September, mills began demanding heavier shipments on low-priced orders, and brokers scrambled to buy, with the result that prices turned sharply upward. By Oct. 1 heavy melting steel had reached $17 at Pittsburgh and late in that month it rose to $18, a gain of $4 from the low point of $14 in July. Following a slight dip in November, the market turned strong again in December, with prices ranging from $18 to $18.50 at Pittsburgh and $16 to $16.50 in eastern Pennsylvania. In the West the price movements were less erratic.

A good deal of the strength that extended to all markets in the Eastern section of the country had its beginning in Pittsburgh. Steel companies that ordinarily have surplus pig iron to sell virtually withdrew at one time from the pig iron market, not only needing all of their own production of iron, but supplementing scrap to as large an extent as possible. Pittsburgh brokers reached out into all outlying districts for scrap, even competing with Buffalo mills for some of the production of that district.



Fluctuations Over Post-War Years in THE IRON AGE *Composite Prices of Pig Iron and Finished Steel. The relative stability of finished steel prices, when compared with pig iron, continues to be demonstrated. The highest finished steel composite figure during* 1928 *was* 3.3 *per cent above the lowest; in pig iron the divergence was* 9.1 *per cent. Since the peak early in* 1923, *both trends have been downward. Finished steel has lost* 15.3 *per cent and pig iron* 40.2 *per cent*

While to some extent the apparent scarcity in the latter months of the year was created by brokers in their rush to cover orders against further rises, two new factors entered the situation. One was increased purchases by Steel Corporation plants, which in previous years had not been regular users of outside scrap, and the other was the extraordinary demand from abroad. In the 10 months ended Oct. 31, 462,700 tons had been exported, compared with 201,055 tons in the corresponding period of 1927.

At the end of 1928 heavy melting steel and compressed sheet steel were selling in the Pittsburgh district at delivered prices equal to or higher than basic pig iron, a condition which probably will furnish its own corrective.

Water Shipments Increase

In an effort to surmount barriers set up by the abolition of Pittsburgh plus, steel producers took greater advantage of water transportation in 1928. Among the unusual cross movements were shipments of steel from Buffalo to Chicago and Detroit by the Great Lakes; transportation of wire products from Pittsburgh to Minneapolis via the Ohio and Mississippi rivers and heavy loadings of pipe and other products from Pittsburgh mills to Memphis and New Orleans.

Iron and steel shipments on the Ohio River in the 11 months ended Nov. 30 were 1,162,445 tons, or about 150,000 tons in excess of the tonnage so moved during both 1926 and 1927. Some of this was inter-plant movement,

but three Pittsburgh companies shipped approximately 300,000 tons of pipe alone to Memphis and New Orleans during the year. With storage facilities at Memphis, which is a center for nine railroads, steel companies have been able to serve the South and Southwest more expeditiously.

The cost of transporting steel by water from Pittsburgh to Memphis, including both the handling and insurance charges, is $5 per ton against an all-rail rate of $11.20, but the difference is not a clear saving, since many of the barges come back empty. However, there has recently been some return haul of fluorspar from southern Illinois mines.

One of the striking water shipments of the year was nearly 40,000 tons of structural steel from Buffalo to Chicago. Detroit automobile manufacturers received entire cargoes of steel bars rolled by Buffalo mills.

Pig iron shipments by water also increased. Cargoes from Buffalo and Cleveland furnaces, totaling at least 50,000 tons, were received at Chicago, Milwaukee, Sheboygan, Wis., and Muskegon, Mich. Official figures give the total pig iron moved down the New York State barge canal as 122,456 tons, of which all but a small portion originated at Buffalo, the remainder at Cleveland. In addition, about 100,000 tons was shipped by water routes other than the New York State canal from Eastern furnaces. The Everett, Mass., furnace sent several shipments to large consumers on the Delaware River near Philadelphia. Upward of 125,000 tons of scrap was shipped from Detroit to Buffalo by boat.

No Large-Scale Consolidations

More consolidation of steel companies was expected in 1928 than actually came to pass. On the last day of 1927 it was announced on authority that the Youngstown Sheet & Tube Co. would merge with the Inland Steel Co., long the conspicuous independent of the Chicago district, which Eastern interests had more than once sought to acquire. However, in March, when negotiations were thought to be about completed, it developed that the parties in interest could not agree on some important features of the proposed merger and therefore the plan was abandoned.

In its issue of Jan. 5, 1928, THE IRON AGE told of the forming of the Empire Steel Corporation and its acquisition of six northern Ohio sheet mills—one each at Mansfield, Cleveland and Ashtabula and three at Niles. The new company has four 75-ton open-hearth furnaces, a blooming mill, a sheet bar mill, 58 sheet mills and two jobbing mills, with an annual capacity of 400,000 tons of finished products.

Spang, Chalfant & Co., Inc., which for just 100 years has operated the Etna Iron & Tube Works, Etna, Pa., and the Standard Seamless Tube Co., Ambridge, Pa., were consolidated in January under the name of Spang, Chalfant & Co. Each has a capacity of 300,000 tons a year.

In July the American Rolling Mill Co. acquired the plant of the Ashland Steel Co., Ashland, Ky., adjoining the blast furnace of the Norton Iron Works Co., which Armco had bought in 1927. The two plants had long been operated jointly, the Norton furnace supplying hot metal for the Bessemer plant at Ashland, which was connected with rod and wire mills.

FURTHER MERGING PROBABLE

The Republic Iron & Steel Co. acquired in August a majority of the stock of Steel & Tubes, Inc., the successor of the Elyria Iron & Steel Co., Elyria, Ohio. The Elyria plant had as its principal product electrically welded steel tubing and also rolls strip steel. As it has bought 3000 to 4000 tons of steel a month, largely billets, the merger gives the Republic company an outlet for that much of its semi-finished product.

Consolidation in the steel industry may be expected to go further. The present year, it is not unlikely, will see additional mergers, including the linking of the Inland company with some Central Western or Eastern interest. Today the Steel Corporation and four leading independents control two-thirds of the country's output. Add seven more to the list and the 12 control 82 per cent. It is not improbable that the 12 will come down ultimately to six or seven.

Exports Increase, with Imports Stationary

Last year at this time we were able to report a moderate increase in iron and steel shipments from the United States to foreign countries as compared with the preceding year, and at the same time to report a decline in incoming shipments, owing mainly to a considerable drop in imports of pig iron. This year we can show a considerable increase in exports, only a portion of which is due to the largely augmented outgoing shipments of scrap. Imports have remained approximately stationary, the gain in 10 months having been about 1 per cent.

Figures for the 10 months show exports aggregating 2,384,301 gross tons, compared with 1,836,730 tons in the corresponding period of 1927; the gain has been 30 per cent. If we exclude scrap, which has reached 462,700 tons this year, against 201,055 tons last year, there still remains a total of 1,921,601 tons of other iron and steel products exported this year, leaving a gain of nearly 18 per cent. Correspondingly, imports have reached 629,301 tons in the first 10 months of 1928, against 623,922 tons a year earlier. Scrap was approximately the same in the two years.

Comparing the figures for rolled and finished steel, we find in the first 10 months of 1928 outgoing shipments amounting to 1,607,239 tons, against 1,429,017 tons last year; the gain here is almost 14 per cent. In imports it is about a standoff, with 335,039 tons coming in this year and 339,406 tons last year, a drop of 1 per cent.

Principal among the increases in exports in the first 10 months of 1928 are steel bars, including alloy steel bars, which showed a gain of 40,000 tons; plates, with 14,000 tons; black sheets, 20,000 tons; hoops, bands and strip steel, 11,000 tons; plain structural material, 38,000 tons; fabricated structural material, 19,500 tons; steel rails, 19,000 tons; barbed wire and woven wire fencing, 18,000 tons.

Import items in the 10 months showed smaller changes than for exports. We brought in 9000 tons more of structural shapes, 3500 tons more in boiler and other plates, 7500 tons more of sheets.

One development of the year was the beginning of a joint effort, on a large scale, to develop American foreign trade in iron and steel. To cultivate markets abroad more effectively, the Steel Corporation and the Bethlehem company formed a common export organization, the Steel Export Association of America, thereby providing a single outlet for 75 to 80 per cent of the rolled steel shipped out of this country.

WHERE THE CHIEF EXPORTS WENT

As has been the case for many years, Canada was the largest buyer of our products last year, taking 41 per cent of the total, against 38½ per cent in 1927 and 39 per cent in 1926. Shipments to Canada in the first 10 months totaled 970,391 tons, against 700,486 tons in the corresponding period of 1927. This gain represented almost 39 per cent. Japan took much more steel from us this year than in the year before; the total in 10 months was 345,913 tons, against 227,445 tons in 10 months of 1927. This represents a gain of 52 per cent. Japan took 14½ per cent of all our exports in 1928, compared with 12½ per cent of the smaller total of 1927.

(*Concluded on page* 118)

Industries and States Receiving Steel in 1928

SUBSTANTIAL gains were made in 1928 in almost all the principal categories of steel production. Only in rails was a loss indicated, by returns from 50 companies making over 93.8 per cent of the entire year's output of the United States.

Production is estimated at 37,300,000 gross tons of rolled steel, which is the largest total ever made in any year. This displaces the high-record 1926 total of 34,819,038 tons, which it exceeds by a little more than 7 per cent. No other year has reached 33,000,000 tons of finished steel.

Estimates of production are based on returns from 50 rolled steel makers, accounting for a total of 35,003,000 gross tons, or about 93.8 per cent of the estimated year's total. This high rate of returns is indicative of the spirit of cooperation of the industry in providing, in confidence, information of broad value. The tonnage reported by

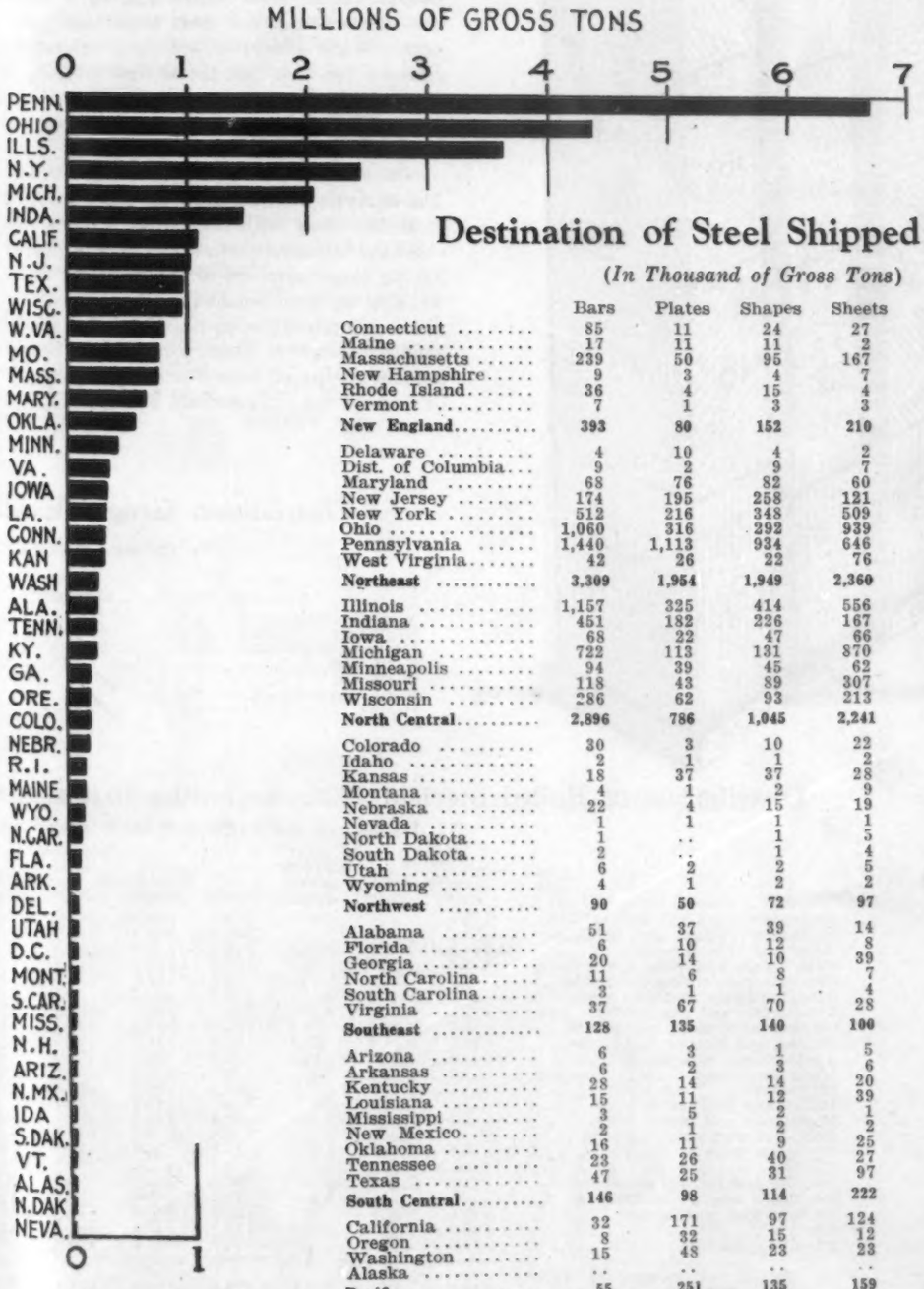


Diagram Shows Distribution of Shipments from Steel Producers' Plants in 1928, (Rails Not Included)

Destination of Steel Shipped in 1928

(In Thousand of Gross Tons)

	Bars	Plates	Shapes	Sheets	Tin Plate	Pipe	Wire Products
Connecticut	85	11	24	27	5	16	116
Maine	17	11	11	2	29	8	12
Massachusetts	239	50	95	167	22	76	103
New Hampshire	9	3	4	7	1	3	7
Rhode Island	36	4	15	4	5	23	11
Vermont	7	1	3	3	2	2	4
New England	**393**	**80**	**152**	**210**	**64**	**128**	**253**
Delaware	4	10	4	2	2	7	4
Dist. of Columbia	9	2	9	7	1	9	5
Maryland	68	76	82	60	244	39	26
New Jersey	174	195	258	121	97	80	45
New York	512	216	348	509	318	281	229
Ohio	1,060	316	292	939	132	280	305
Pennsylvania	1,440	1,113	934	646	109	521	258
West Virginia	42	26	22	76	56	126	38
Northeast	**3,309**	**1,954**	**1,949**	**2,360**	**959**	**1,343**	**910**
Illinois	1,157	325	414	556	402	289	278
Indiana	451	182	226	167	47	76	107
Iowa	68	22	47	66	2	31	64
Michigan	722	113	131	870	21	109	377
Minneapolis	94	39	45	62	8	50	103
Missouri	118	43	89	307	39	101	117
Wisconsin	286	62	93	213	51	53	114
North Central	**2,896**	**786**	**1,045**	**2,241**	**570**	**709**	**1,160**
Colorado	30	3	10	22	2	19	39
Idaho	2	1	1	2	..	4	15
Kansas	18	37	37	28	1	139	31
Montana	4	1	2	9	..	13	17
Nebraska	22	4	15	19	2	23	29
Nevada	1	1	1	1	..	1	2
North Dakota	1	..	1	5	..	2	3
South Dakota	2	..	1	4	..	6	10
Utah	6	2	2	5	8	11	10
Wyoming	4	1	2	2	..	81	13
Northwest	**90**	**50**	**72**	**97**	**13**	**299**	**169**
Alabama	51	37	39	14	1	23	20
Florida	6	10	12	8	..	17	15
Georgia	20	14	10	39	9	25	27
North Carolina	11	6	8	7	1	14	27
South Carolina	3	1	1	4	1	12	10
Virginia	37	67	70	28	22	27	41
Southeast	**128**	**135**	**140**	**100**	**34**	**118**	**140**
Arizona	6	3	1	5	..	8	8
Arkansas	6	2	3	6	..	27	23
Kentucky	28	14	14	20	2	50	45
Louisiana	15	11	12	39	33	175	34
Mississippi	3	5	2	1	..	3	10
New Mexico	2	1	2	2	..	3	8
Oklahoma	16	11	9	25	..	524	36
Tennessee	23	26	40	27	7	31	36
Texas	47	25	31	97	20	721	104
South Central	**146**	**98**	**114**	**222**	**62**	**1,542**	**304**
California	32	171	97	124	181	361	131
Oregon	8	32	15	12	27	19	28
Washington	15	48	23	23	44	29	43
Alaska	..	..	..	..	16	..	1
Pacific	**55**	**251**	**135**	**159**	**268**	**409**	**203**
Total	**7,017**	**3,354**	**3,607**	**5,389**	**1,970**	**4,548**	**3,139**

In Year of Greatest Output, Automobiles Took Lead in Steel Consumption, With 18 Per Cent, Against 14 Per Cent Last Year. Railroads, formerly the largest outlet for steel, fell to third place

those 50 companies was considerably greater than the aggregate tonnage of all companies in any preceding year.

Moreover, a larger proportion than ever before provided detailed classification of distribution of their shipments. This group accounted for 31,103,000 tons, or 83.4 per cent of the aggregate output, compared with 78 per cent last year, 73.3 per cent for 1926 and only 65.5 per cent for 1925. The table at the bottom of these pages shows a composite of the data furnished by the industry.

Territorial Distribution

IT has been found possible this year to indicate clearly the destinations of large quantities of steel products, not only by general geographic divisions of the country, but even by States. This has been shown both by diagram for the total steel output (aside from rails) and in a table showing seven of the most important products. While complete accuracy cannot be claimed for this territorial distribution, it is believed to be accurately indicative of the destinations of the various tonnages as shown.

One word of comment should be made. The analysis shows where the steel shipped from the steel mills went, but it does not show the ultimate destination. Those States having large numbers of intermediate mills working up semi-finished steel, produced by plants containing open-hearth or Bessemer capacity, show a disproportionately heavy amount compared with States having fewer or none of the intermediate plants. This is

Distribution Geographically of

Percentage to Each of Sev

	Bars	Shapes	Plates
New England.....	5.6	4.2	2.4
Northeast	47.2	54.1	58.3
North Central.....	41.3	29.0	23.4
Northwest	1.3	1.9	1.5
Southeast	1.8	3.9	4.0
South Central.....	2.0	3.1	2.9
Pacific	0.8	3.8	7.5

Distribution of Rolled Steel in 1928, According to Shipments

Amount of Each Form Taken, in Thousands

	Heavy Rails	Light Rails	Track Accessories	Plates	Structural Shapes	Bars	Hoops, Bands and Cotton Ties
Railroads (cars and locomotives)	0.1	....	....	538.6	226.1	235.0	8.4
Railroads (bldgs. and bridges)	0.1	....	....	101.9	202.3	144.7	1.5
Railroads (track work)	1,964.5	1.6	688.3	16.2	2.5	32.8	0.3
Fabricators and bldg. contractors	2.3	0.9	0.2	592.7	1,795.5	202.5	20.1
Concrete reinforcing companies	....	....	....	1.8	12.5	453.3	11.6
Bldg. hardware and trim companies	....	....	....	2.4	21.2	33.5	12.6
Automobile and parts mfrs.	0.1	....	0.1	162.7	29.0	1,587.3	460.0
Oil, gas and water companies	0.8	....	0.4	125.5	31.1	35.8	10.3
Mining and lumber companies	16.1	57.4	11.1	16.8	11.7	27.5	3.1
Agricultural equipment	0.9	0.1	0.1	42.6	59.7	618.1	58.3
Metal containers	....	....	....	1.7	1.4	3.5	60.5
Shipbuilding	....	....	....	53.1	28.0	11.9	0.2
Boiler and tank mfrs.	....	....	....	455.1	43.8	21.9	0.6
Machinery and hand tools	0.5	1.3	0.1	69.2	62.3	407.1	8.8
Bolt, nut and rivet makers	....	....	....	1.4	0.7	389.8	4.3
Electrical mfrs.	0.1	....	....	28.1	14.8	29.4	11.1
Forgers	....	....	....	2.8	....	198.0	....
Pressed and formed metal mfrs.	....	....	....	17.7	.....	3.7	0.1
Furniture and stove makers	....	....	....	....	0.5	12.9	34.3
Jobbers and warehouses	1.4	6.8	14.9	181.6	305.9	418.8	45.5
Exports	160.0	9.7	25.6	221.5	168.4	152.7	18.8
Miscellaneous	37.7	3.3	8.3	145.7	137.4	503.9	68.9
Totals, 42 companies fully distributed	2,184.6	81.1	749.1	2,779.1	3,154.8	5,524.1	839.3
Eight companies, not distributed	219.8	....	72.3	349.2	273.8	990.5	3.9
Total, 50 reports	2,404.4	81.1	821.4	3,128.3	3,428.6	6,514.6	843.2
Total for year	2,404	91	....	3,354	3,607	7,017	....

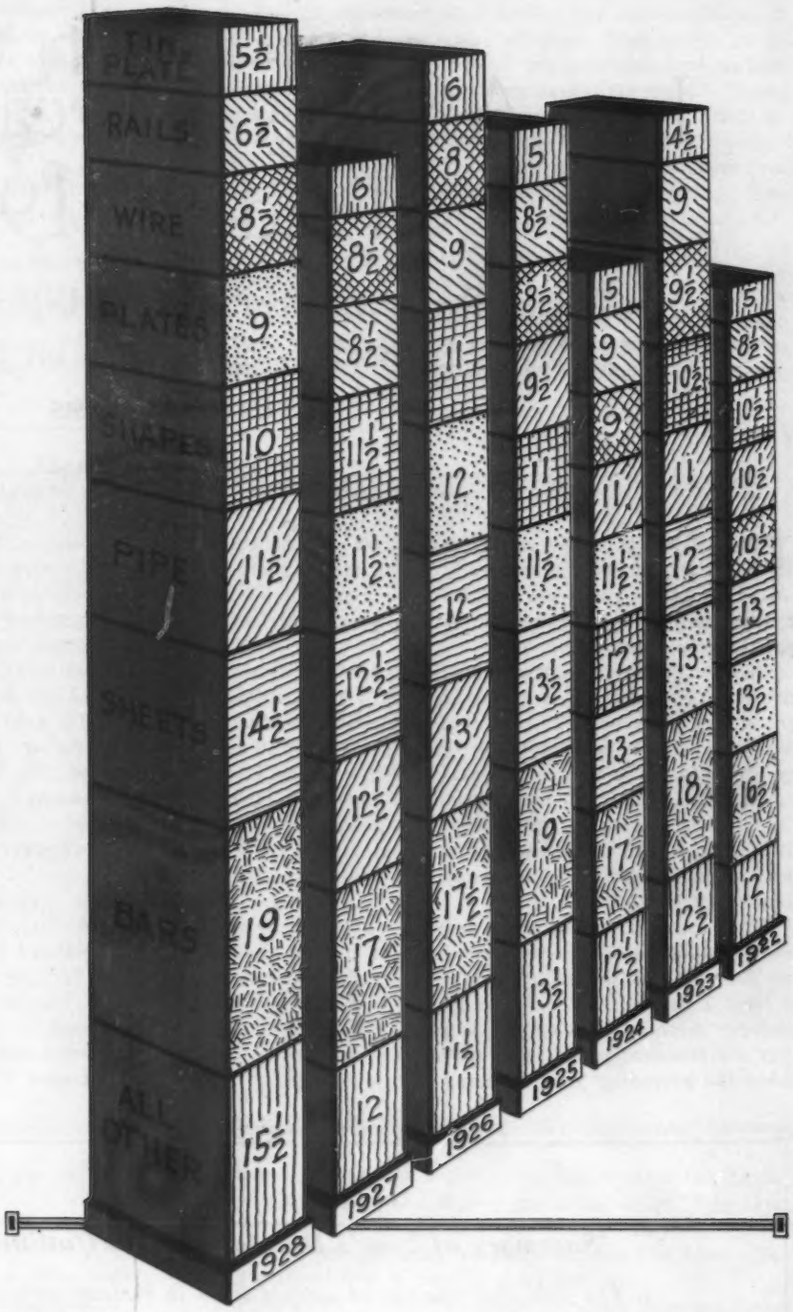
because the returns are based upon shipments of the steel-producing companies and not upon shipments of the final finishing mills.

Motor Cars Took More Steel Than Railroads

Automobiles, for the first time in the history of the industry, have taken the leading place in consumption of steel. Careful estimates, added to direct returns in the manner described above, place the automotive consumption at 18 per cent of the huge total of the year. This connotes approximately 6,700,000 tons of steel. Building and other construction of all kinds (excepting that for the railroads) accounted for 16½ per cent of the total, or about 6,150,000 tons. The railroads, which had held first position year after year until they were displaced by building and construction last year, have now been relegated to third position, with 16 per cent of the aggregate tonnage, or approximately 5,950,000 tons.

Among the smaller but none the less important outlets for steel production, first place after the "big three" is taken by the combination of oil, gas, water, mining and lumbering, with 9½ per cent of the total. This is a larger ratio than last year and is equivalent to that of the large 1926 production. This indicates approximately 3,600,000 tons of steel products.

Exports last year were exceptionally large, reaching 6½ per cent of the total output. It is estimated that the exports aggregated 2,200,000 tons. Agriculture, which is placed at 6½ per cent, was responsible for a similar tonnage.



Various Forms of Steel

eral Groups of States

Sheets	Tin-Plate	Pipe	Wire Products
3.9	3.2	2.8	8.0
43.8	48.7	29.5	29.0
41.6	28.9	15.6	37.0
1.8	0.7	6.6	5.4
1.8	1.7	2.6	4.5
4.2	3.2	33.9	9.7
2.9	13.6	9.0	6.4

of 50 Companies Producing 93.8 Per Cent of the Year's Output

of Gross Tons, by Different Industries

Black Plate for Tining	All Other Black Plate and Sheets	Tubes and Pipe	Wire Products	Strip Steel	All Other Finished	Billets and Slabs	Sheet and Tin Bars	Wire Rods	Skelp	Totals
....	207.7	73.5	25.2	3.7	144.1	6.8	....	....	....	1,469.2
....	5.2	0.8	7.5	....	18.0	4.1	10.7	1.0	....	497.8
....	....	0.4	12.0	....	16.7	....	....	....	....	2,735.3
....	149.3	49.2	133.0	43.3	50.7	0.1	22.3	15.6	31.3	3,109.0
....	5.4	0.1	12.2	....	....	....	....	1.7	....	498.6
5.0	117.2	9.1	46.7	19.6	0.2	....	....	....	....	267.5
0.3	1,559.7	81.3	159.8	760.4	88.5	187.2	106.6	6.9	....	5,189.9
45.1	59.4	1,165.2	22.0	....	27.9	0.9	....	3.0	45.0	1,572.4
....	12.6	4.4	11.4	....	5.3	0.2	....	3.9	....	181.5
....	88.9	21.7	495.1	20.3	10.6	2.0	....	122.1	....	1,540.5
1,224.1	114.3	4.0	30.3	0.8	29.4	....	21.4	1.0	....	1,492.4
....	2.0	12.3	3.9	....	7.4	....	....	1.0	....	119.8
....	46.1	10.6	0.4	....	0.3	....	....	....	....	578.8
....	57.6	29.2	19.8	26.0	20.9	37.0	....	4.9	....	744.7
....	....	0.4	95.4	12.5	0.1	27.2	....	14.4	....	546.2
....	226.0	63.2	2.0	6.1	0.2	....	....	....	....	381.0
....	0.2	0.5	....	....	....	61.7	....	....	....	263.2
4.7	46.5	1.9	0.4	86.7	5.0	....	1.3	....	....	168.0
0.6	264.8	11.0	30.7	30.5	....	....	....	....	....	385.3
54.3	389.9	932.2	371.9	26.2	24.9	24.4	....	9.6	....	2,808.3
327.9	237.2	200.5	138.4	10.5	99.0	6.6	....	16.6	27.5	1,820.9
113.1	797.3	143.7	419.6	205.9	51.9	654.0	756.1	276.8	409.7	4,733.3
1,775.1	4,387.3	2,815.2	2,037.7	1,252.5	601.1	1,012.2	918.4	478.5	513.5	31,103.6
91.9	544.9	641.9	228.5	....	66.3	128.4	163.2	66.4	57.7	3,898.7
1,867.0	4,932.2	3,457.1	2,266.2	1,252.5	667.4	1,140.6	1,081.6	544.9	571.2	35,002.3
1,970	5,389	4,548	3,139	....	....	....	....	....	....	37,300

Bars Maintained Their Leadership Inherited from Previous Years—Together with Sheets, Both Affected by the Huge Motor Car Production, They Registered Gains, While Some Other Forms Declined

Less Activity Forecast for Steel Trade in 1929

Some Recession From Record Heights Anticipated by Economist—Year Starts on Generally Excellent Basis

BY DR. LEWIS H. HANEY
DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

DURING the year just closed, in which business activity showed a generally rising trend, there was a fairly good recovery from the recession of 1927. Expansion of the automobile and copper industries was particularly notable.

Industrial activity during 1928, however, averaged relatively little above the average for 1927. Total industrial production was about 2⅛ per cent larger than in the preceding year. Manufacturing production, largely influenced by the automobile industry, averaged 3½ per cent higher; automobile production was actually 27 per cent greater than in the preceding year. The volume of trade showed little change; wholesale sales were about 1 per cent lower in 1928 than in 1927, and department store sales varied less than 1 per cent.

Two standard indexes of business activity averaged lower than in 1927—factory employment during the year ran 3.2 per cent behind, and railroad freight tonnage was at least 2 per cent smaller (see Fig. 1). While changes in business methods may explain a part of these reductions, they are sufficient to indicate that activity was not so much above the preceding year as many have supposed.

Those who form opinions from newspaper headlines may be surprised at this showing, but they are the same ones who saw no recession in 1927. The explanation lies in the relatively low point at which the year 1928 began and the rather moderate amount of the expansion itself. In October, 1927, manufacturing production was only 107 per cent of the average for the years 1923-1925. During the next 12 months it increased 11.8 per cent. In November, 1927, factory employment was only 86 per cent of the average for 1923, and increased only 2 per cent during the year. Car loadings rose 7.5 per cent in 1928 and wholesale trade 4.4 per cent; department store sales actually decreased and in November, 1928, were about 0.3 per cent lower than a year ago.

The biggest expansion occurred in credit and speculation, which is the more remarkable in that there was already an extended position at the beginning of the year. Total loans and discounts of the member banks increased 6½ per cent. Brokers' loans increased 56 per cent. Stock prices rose by from 25 to 30 per cent. The volume of trading in stocks increased enormously, the number of shares (51,000,000) traded in November, 1927, being less than one-half the

Summary of Year's Developments as Outlined by Doctor Haney

1. *The year* 1928 *was one of upward trend in business activity and in earnings.*

2. *At the end of the year industrial activity was at peak levels. This is true also of iron and steel production. As this high activity was accompanied by strained credit and high money rates, while commodity prices were tending to sag (notably farm prices), the coming of some recession in* 1929 *is indicated.*

3. *The year* 1928 *was marked by great inflation in the stock market, while business was practically free from this malady. The outstanding feature of the year was the extraordinary activity in stock speculation and the most extensive bull market in history, together with an abnormal diversion of funds into loans to brokers and dealers in securities. A notable characteristic was the low return on invested capital, as measured by yields on high-grade bonds, and the high cost of short-term money. In the second half a declining trend of bond prices and two violent breaks in stocks, with demand loans running to* 10 *per cent and over, indicated that the final stage was near.*

4. *The outlook at the beginning of* 1929 *is less favorable than it was a year ago, for business is at a peak and not at the beginning of recovery, as it was in January,* 1928. *Some time during the year there probably will come a business recession, the degree depending on the promptness with which the necessary readjustments are begun. Reduced building activity and over-production of automobiles seems likely. Over-production of pig iron is near. The absence of inflation in business, however, should make any recession moderate and should facilitate a recovery.*

115,000,000 shares bought and sold in November, 1928. Along with expansion the volume of bank debits soared, amounting in November, 1928, to nearly 28 per cent more than in the same month a year ago (Fig. 1). At the same time with this fearful enlargement of the brokers' loans account, commercial loans increased by $485,000,000. And the country lost about $500,000,000 in gold.

It is, therefore, no wonder that money rates rose toward the end of the year to levels which had not been attained since the crisis year of 1920.

At the end, in spite of a sharp reaction in the stock market, we find industrial activity, even allowing for normal growth, at approximately the peak levels of 1923 and 1926. Stock prices are still very high, judged by any past standards. The security markets still retain an abnormally large volume of credit, and money rates promise to remain tight for some months.

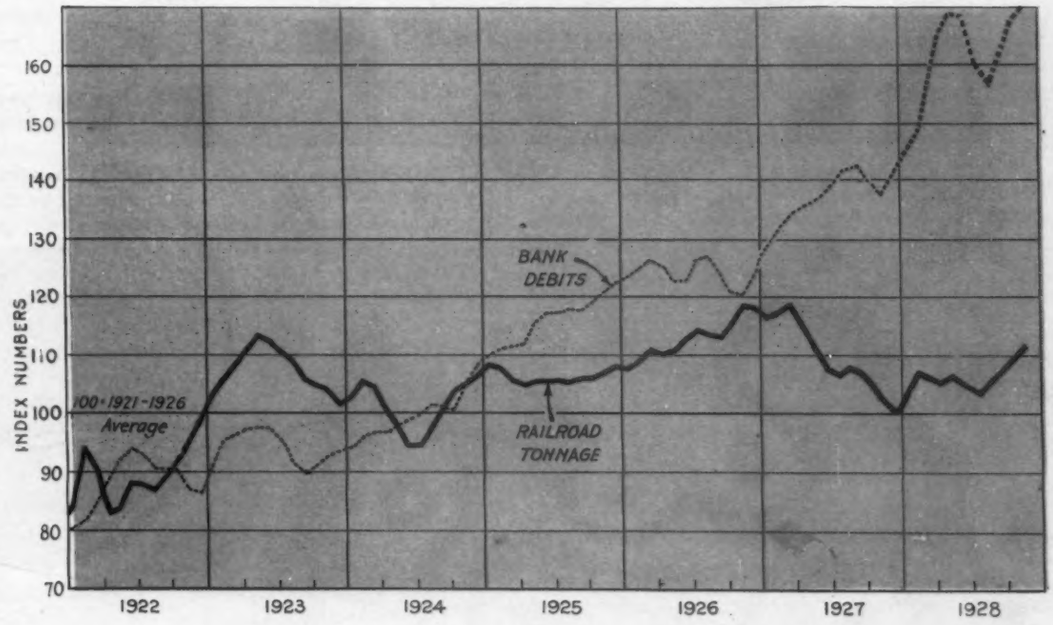


Fig. 1 — While Freight Traffic for the First 11 Months Was 2 Per Cent Lower Than in 1927, bank debits, on account of great speculative movements, made the highest record ever known, averaging 28 per cent higher in November than a year earlier

Better Business Bases Evolved

DURING the year, considerable progress was made toward improving business fundamentals, although important unsolved problems of credit and banking practice developed. Among the business improvements we may list the following.

1.—Increased control by trade organizations, as in copper, sugar, textiles and several others. Many mergers were effected, some of which probably are desirable. It may also be said that more efficient government cooperation with business was displayed.

2.—Further recovery was made by a number of the nation's backward industries, including oil, cotton textiles, rubber tires and railroad car building. The copper industry completely recovered and became one of the more profitable lines. In this connection it may be said that the basis for recovery in the more depressed sections of the country was laid, and near the end a turn for the better appeared in the Southeast and in New England.

3.—Exports, contrary to the expectations of a good many observers, showed a rising trend (Fig. 2), and export markets were an important factor in the prosperity of the automobile, machinery and electrical appliance industries.

4.—An important step toward the redistribution of the world gold supply was effected. This marks progress toward the adoption of the gold standard as distinguished from the gold exchange standard. Much, however, remains to be accomplished in this direction.

5.—Great progress was made in methods of production and marketing. Operating expenses were reduced, allowing profits to be made at lower prices. The increased efficiency of railroad operations was notable.

Farmers Received More Goods for Crops

In the calendar year 1928 the farmers made a better living than in 1927 (Fig. 3). During the first half of the year farm prices advanced and the farm dollar gained in purchasing power. Marketings were large, also. In the second half, however, the price situation became less favorable, particularly in the case of grain and hogs. The total value of the chief crops for 1928-1929 is less than for the previous season, but dairy products increased in value. The farm condition now is neither good nor bad.

On the other hand, it remains true that important maladjustments either developed or were intensified during 1928. Among these, the outstanding one occurs in the field of credit.

Excessive Speculation in Securities

We heard more about "brokers' loans" in 1928 than ever before, and justly so. During the year there was an increase of about 1½ billion dollars, marking an unparalleled diversion of funds into stock-market channels. Moreover, the proportion of these loans drawn from other than banking sources increased notably, as did the percentage of the loans made on demand rather than on time. Extensive purchases of bankers' acceptances by the Federal Reserve Banks were made the means of pumping credit into the stock market.

Inflation in this same quarter was intensified by the expansion of deposits in connection with foreign loans, which was made possible by the gold exchange standard. At the end of the year, the ratio of loans and discounts to net demand deposits was over 120 as compared with 109 a year ago. The ratio of loans and investments to total deposits was 113, against 108 at the beginning. All this found ex-

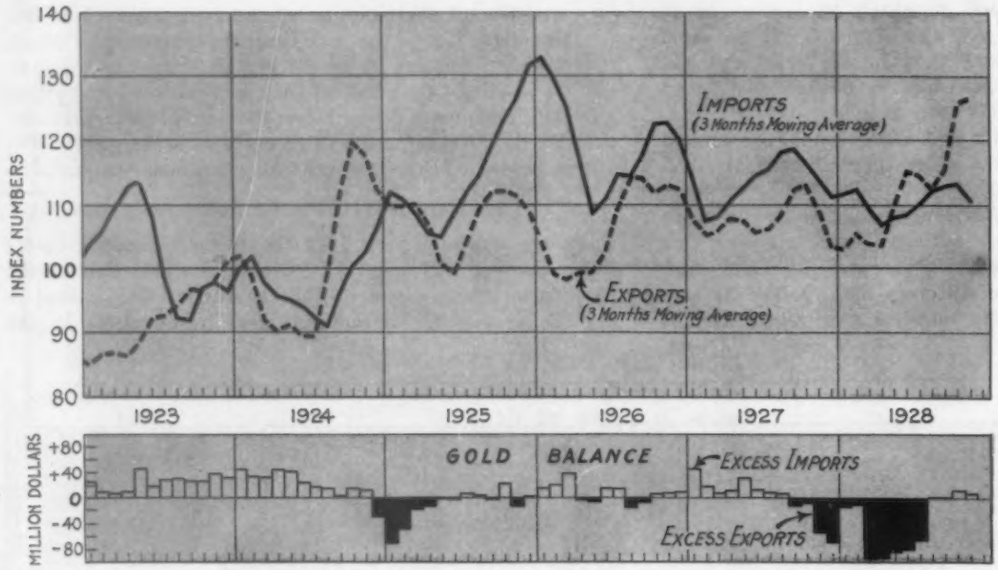


Fig. 2 — Imports, Which Are Regarded as a Good Index of Industrial Activity, Were Lower in 1928 Than in 1927. Exports, contrary to expectations, rose considerably during the year. Gold flowed outward in heavy volume

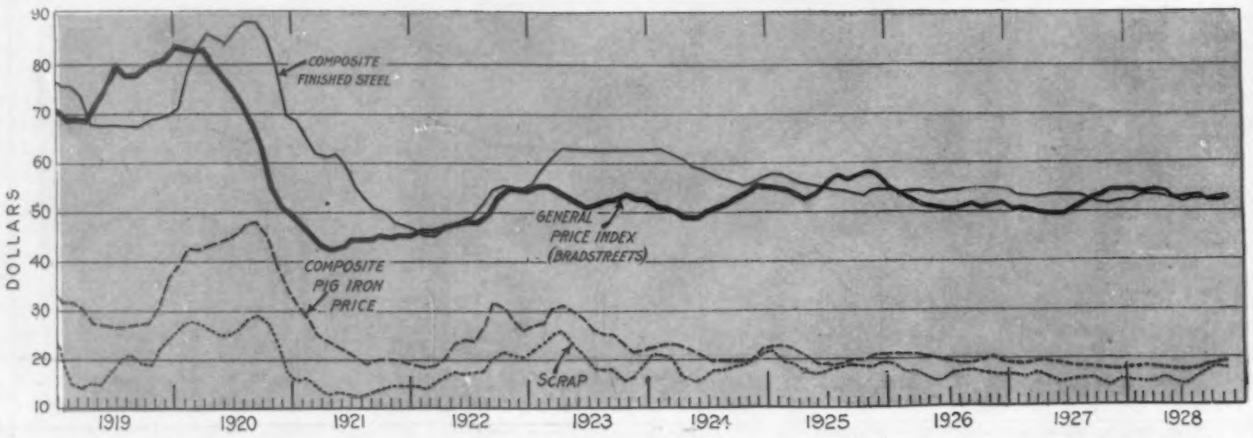


Fig. 4—Commodity Prices Have Been Slowly Declining for Several Months. Finished steel prices have been better recently, but pig iron during the year averaged lower than in any year since 1915. Scrap has been recently much higher than since early 1926

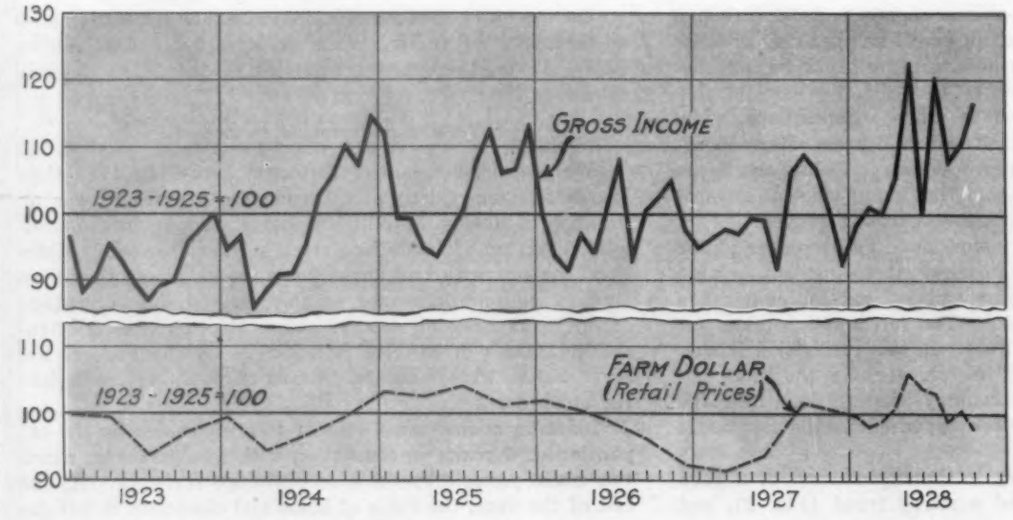


Fig. 3—While the Purchasing Power of the Farmers' Dollar Has Declined Since May, It Has Averaged Well Above 1927. The gross income from farms was much higher, owing largely to better prices for most things the farmer produces

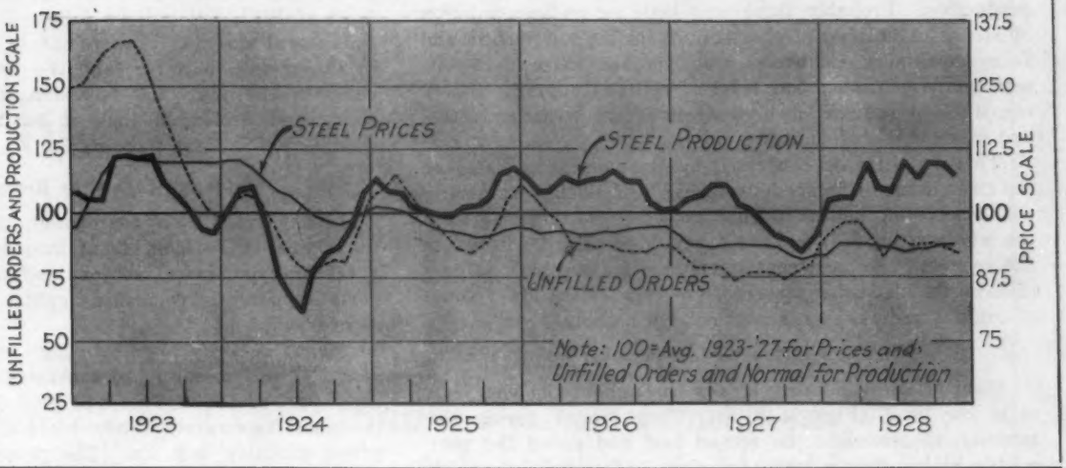


Fig. 5 — Finished Steel Prices Were Higher in December Than at Any Time Since Early 1927. Production made a new high record. Unfilled orders were high, but have dropped recently

pression in 12 per cent call money and 8 per cent time money, rates which do not exist except in periods of strained credit.

Perhaps the most notable maladjustment is that existing between the return on invested capital and the cost of money. Short-term money rates normally fluctuate around the yield on bonds, and a condition in which bonds yield only about 4½ per cent while money costs over 8 per cent is decidedly abnormal. It must tend strongly to check the flow of funds into investment. In the second half of 1928 the bond market was very dull. There was a large decline in new security issues, particularly in bonds.

In this connection, we note that the yield on common stocks fell much below the yield on high-grade bonds, indicating the extent to which speculation has replaced investment.

More Goods Made Than Market Needs

Finally, it may be said that at the end of 1928 the production of commodities had become high in comparison with the demand. In a general way, industrial production has reached levels at which, in the past, it has been found impossible to market the total product at current prices. This is probably the chief reason why inflation has not appeared in business to any important extent, and why commodity prices have declined (Fig. 4) while stock prices have skyrocketed. We find that the *total value* of the industrial production has begun to decline, as commodity prices have sagged. The P-V line (ratio of commodity prices to physical volume of trade) is on the downgrade.

Another indication is the fact that industrial production is so high in comparison with primary distribution, as measured by railroad freight shipments. Again, stocks of commodities in producers' hands are large and appear to be increasing at the end of the year. Such a condition usually marks the peak of a business cycle.

Pig Iron Production Too High

TOWARD the end of the year the ratio of pig iron production to steel ingot production rose, and became abnormally high in November, indicating the approach of over-production. The year 1928 saw a steady expansion in the average daily production of pig iron that brought it, from below normal, up to 15 per cent above normal at the end.

Steel ingot production jumped to a high level in April and then fluctuated irregularly close to the April peak (Fig. 5). A year ago ingot production was 15 per cent under normal. Last November it was nearly 15 per cent above normal. The general trend of unfilled steel orders was downward during the year (Fig. 5).

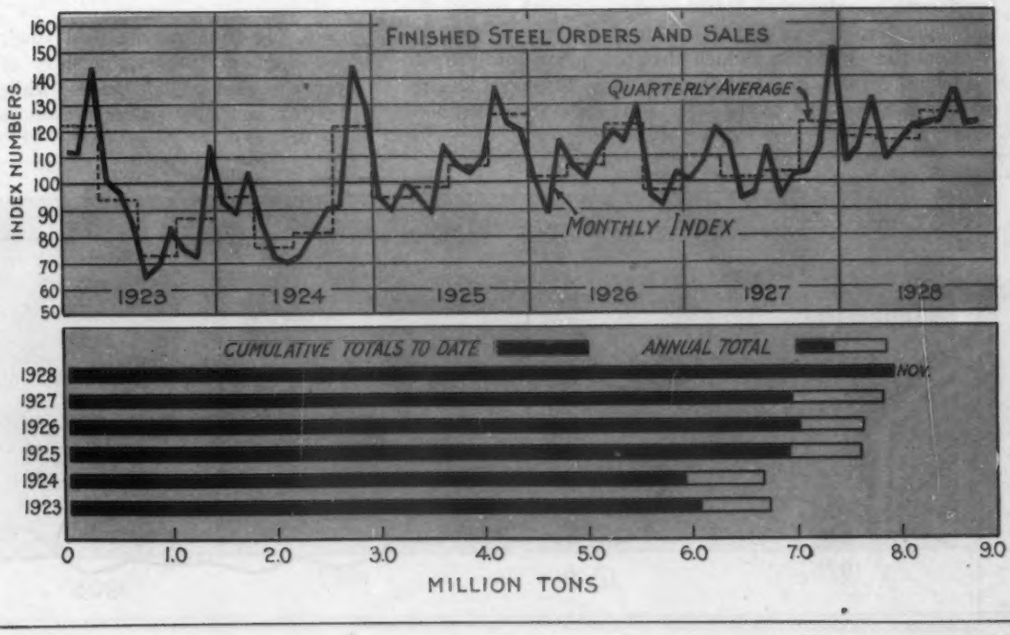


Fig. 6—Buying of Finished Steel in the First Eleven Months Exceeded the Twelve-Month 1927 Total, and Has Reached the Highest Volume Ever Recorded

Activity of steel-consuming industries expanded during the year until November, and justified the high level of production. Probably there was little or no accumulation of stocks of finished steel. Activity in the automobile and farm machinery industries was notable, more than offsetting the continued low level of railroad buying. Heavy construction brought a high demand for structural steel and fabricated steel plates.

This condition is confirmed by the volume of sales of the chief items of finished steel (Fig. 6). Such sales during the first eleven months of 1928 exceeded the total sales for the whole year 1927, making a new high record. Probably the year saw the most consistently maintained high volume of sales that has ever occurred. In view of the low volume of unfilled orders, this is particularly notable.

Prices Improved in December

Steel prices held fairly steady throughout the year, but at a low level (Figs. 4 & 5). They dipped during the summer, recovered in the second half and ended the year a little higher than at the beginning. After declining with building operations in the spring, sheets and nails held steady, and sheets in August began a rise that recovered nearly all the ground lost. Bars were firm throughout and the trend was slightly upward.

Steel scrap rose sharply between July and October; then reacted. Pig iron recovered somewhat in September and in November reached the highest level since July, 1927. At the end of the year there were signs that price advances in finished steel had been checked, and it semed probable that declines were due in pig iron.

Business Decline Forecast for 1929

MOST indications suggest a considerable decline in business during a part of the year 1929. One plausible hypothesis is that, after an irregular start, with activity a little lower than at the peak in September, 1928, some recovery will occur in the spring, reaching about the high level of 1927; but will be followed by a recession lasting for several months. If there should be little or no recovery in the spring, however, and the downtrend should set in early in the year, the recession would probably be less sharp and prolonged than if business were to make a "double top" before receding.

Money Likely to Remain High

In any event there are enough favorable conditions—in the shape of freedom from business inflation, sustained purchasing power of laborers and farmers, and large exports—apparently to insure against any severe decline or depression.

Money is likely to remain high in the early part of the year. It will certainly be considerably higher than in the early part of 1927. This will tend to curtail business and to cause moderately lower commodity prices. Pig iron prices probably will dip. The present high level of production will tend to have the same effect.

Net Earnings in Some Jeopardy

Profits are now so dependent on a very large volume of business, accompanied by low margins per unit of product, that even a relatively small decline in volume or in prices, or in both, probably will cause a sizable decline in net earnings.

The foregoing is perhaps attempting to "draw it pretty fine." It seems, however, to be consistent with the present reading of the P-V line and the various steel barometers with which readers of THE IRON AGE are familiar. At least, caution in planning any business expansion beyond the early spring months is strongly indicated. There is a real possibility that continued high money rates may curtail expansion programs in 1929.

Scrap Prices Higher at Year-End Than Since 1926

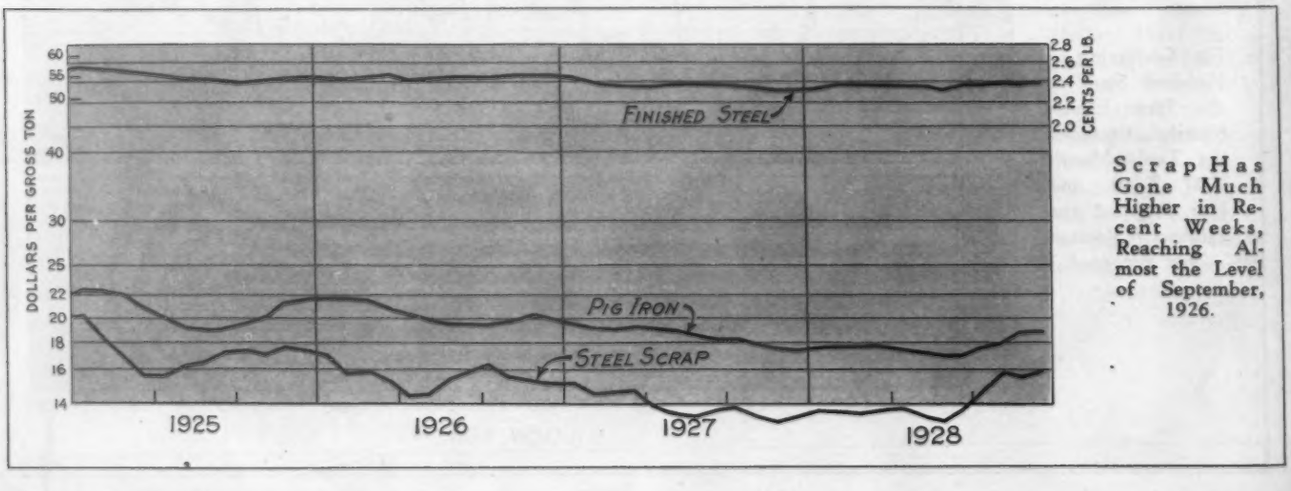
AVERAGE prices of heavy melting steel scrap at Chicago, Philadelphia and Pittsburgh showed great strength in the last quarter, in sharp contrast with the slump culminating in July. The average on July 15 was $13.08 a gross ton.

Well-held gains since then produced a peak of $16.08 at the end of October and a further peak, after intervening easing, of $16.25 just before Christmas. The average for fourth quarter was $15.83, compared with $13.88 for third quarter. It was $13.38 in fourth quarter of 1927.

Meantime pig iron, which dropped after mid-year to the lowest level it has had in more than 12 years, has recovered nearly $1.50 of the loss. The differential between THE IRON AGE pig iron composite at the end of the year and the scrap average was less than $3 a ton. This compares with more than $6 a ton about two years ago.

Finished steel has had only slight fluctuations since early 1927. It declined in July to 2.325c. a lb., which, with the exception of the level of a year ago, was the lowest since the summer of 1922. It has recovered, however, to 2.391c., which is its highest level in 22 months.

Comparative figures for 24 months, covering steel scrap, pig iron and finished steel, are given on page 71. The diagram carries the story of these changing prices over a period of five years, while detailed tables of the pig iron and steel prices are on page 121.



Scrap Has Gone Much Higher in Recent Weeks, Reaching Almost the Level of September, 1926.

What Consuming Channels Promise

Facts, Figures and Views That Should Aid in Forecasting a Given Business—Achievements in Industries Using Iron and Steel and Metal-Working Machinery, and the Outlooks in Brief.

IN the pages immediately following are grouped surveys of an authoritative character of those industries and activities which are notable users of iron and steel and metal-working machinery. Apart from the interest that lies in recent developments in these cases and in the individual outlooks, the average metal-working plant should be able to gather from these articles suggestions of likely help in forecasting its particular business. With the growing practice of attempting to estimate on something more than a hunch what the future holds forth for a given manufacturer, this group of analyses should aid in providing the basis, or for modifying, if necessary, already established conclusions, respecting the future.

Included among the consuming industries discussed are two which promise to take on size, airships and airplanes. In particular airplane manufacturing has been treated at considerable length, because that is at the moment in a period of active expansion. Briefly, the surveys show among other things the following:

That automobile production this year may exceed the 1928 record, particularly as exports are expected to increase.

* * *

That airships must be bigger and better than ever and that dirigibles will ultimately be practically all-steel structures.

* * *

That airplane manufacture will reach between 10,000 and 12,000 planes in 1929 as compared with 4000 planes last year.

* * *

That exports of iron and steel products, with special reference to Latin America, offer expansion through quality and service factors.

* * *

That shipbuilding may be revived, with activity in 1929 greater than the country has known since the war.

That building construction will continue heavy because new capital is available and construction costs are stabilized.

* * *

That public works construction, or civil engineering projects, are likely to make up for any recession in other construction.

* * *

That agricultural implement business will show a further gain, despite its using 30 per cent more steels and 400 per cent more machine tools last year than in 1927.

* * *

That jobbing of steel has strengthened its place in the scheme of distribution.

* * *

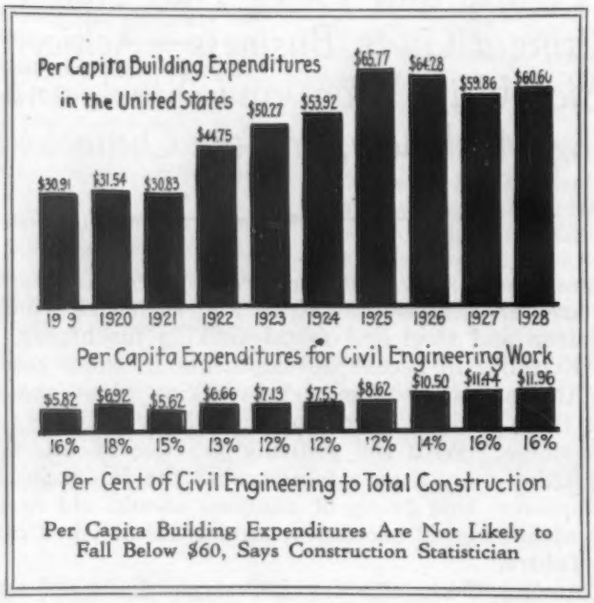
That railroad equipment buying will finally become noteworthy after repeated annual claims that it was imminent on a large scale.

Stable Building Volume Expected

Civil Engineering Projects Likely to Forge Ahead This Year, Making Up for Possible Recession in Other New Construction

BY THOMAS S. HOLDEN*

BETWEEN 1921 and 1925, the period of most rapid expansion of the construction industry, per capita building expenditures in the United States increased from $30.83 to $65.77. The four-year period from 1925 through 1928 has been one of necessary readjustment following the era of rapid growth. Speculative building, at its peak in 1925, has given way in a measurable degree to investment building; building financing has become more conservative; building-field sales and contracting organizations have been examining their facilities and their markets in order to eliminate wasteful and uneconomic practices.



Per Capita Building Expenditures Are Not Likely to Fall Below $60, Says Construction Statistician

Total building expenditures and per capita building expenditures declined a little in 1926, and still more in 1927, and then came up with a moderate increase in 1928. The per capita figures were as follows: 1925, $65.77; 1926, $64.28; 1927, $59.86; 1928, $60.60. Since this four-year period has included one year of definite recession, it seems safe to say that under normal conditions, per capita building expenditures are not likely to fall appreciably below $60 hereafter; this level of expenditures has been fairly well established as a result of the increased wealth of the country.

Increased building volume hereafter can be due to two causes. In the first place, a growing population maintaining the same general living standard and the same per capita building expenditures, would result in a moderate annual increase in building volume. Secondly, a growing population with increasing wealth and advancing living standards is likely to show in future years a larger population, spending something more than $60 per capita for building. Since our population and wealth are both rather likely to increase, it is reasonable to expect our long-time trend of building volume to be upward.

Investment Market a Guide to Building Prospects

IN considering the prospect for 1929, the principal question is whether the period of readjustment and stabilization will continue through all or most of the year, or whether the normal upward trend is likely to get a new start early in the year. Perhaps the best guide for answering this question is the condition of investment markets.

Last year's construction increases over 1927 were definitely forecast by increased amounts of corporate and municipal bond issues in the latter part of 1927. Investment markets were in a turmoil through most of 1928. We lost large amounts of gold, interest rates rose, the volume of new bond issues fell (although new stock issues increased), prices of stocks rose to unprecedented heights and had a severe set-back later in the year. If conditions of the bond market are as important advance indicators for construction today as they were a year ago, we should have to anticipate reduced building volume through a large part of 1929.

But, within the more specialized field of construction financing, there have been strong stabilizing influences and strong indications of improvement. Issues of first mortgage real estate bonds increased in 1928; there was an increasing tendency to finance construction with issues of stock; mortgage loans by life insurance companies, assets of building and loan associations, and savings deposits all increased. Important measures have been taken tending to stabilize the financing of large and small building projects. These factors would all tend to resist any building decline.

Building Volume Should Equal That of Late Years

ON the whole, it appears safe to estimate the country's total building volume for 1929 at something near the average of the past four years. This would call for expenditures of approximately $2,700,000,000 for non-residential buildings that amount to $5,000 or more each, and of approximately $2,900,000,000 for residential buildings of the same price class (which is the price range of the F. W. Dodge Corporation's contract statistics.) In recent years building-field sales organizations have shown an increased interest in small building work (new and alterations) below the $5,000 minimum. This class would include farm buildings, low-cost dwellings, garages, filling stations among the new buildings and the bulk of the remodeling, alterations and modernization work. Apparently new low-cost buildings of this price class have steadily declined in volume since 1925, but there has been an increase in remodeling and alteration work. An extremely rough estimate for all work of this class in 1929 would be from $1,650,000,000 to $1,700,000,000.

*Vice-president in charge of statistical division, F. W. Dodge Corporation.

When we turn from building to civil engineering work, we discover a different story. Per capita expenditures for this class of work increased from $5.62 in 1921 to $8.62 in 1925, the period of rapid building expansion. There was a considerably slower growth in this class of construction expenditures than in building expenditures. During this growth period civil engineering expenditures represented only 12 per cent of total construction expenditures, whereas there is reason to believe that 16 per cent represents a more balanced construction program.

Although civil engineering expenditures have continued to increase from 1925, the country's needs for work of this class have not been fully taken care of; there are many large planned projects that have not yet been awarded, and many more that are needed are likely to be definitely planned in 1929.

The principal prospect for construction increase this year is in engineering projects: power-developments, electrification projects, highways, bridges, flood-prevention projects, sewers, and other large engineering works of public character. In short, the effective demand for buildings by private individuals and investors does not seem to call for building increases; community needs are in the foreground, and they demand increased expenditures on projects that will make our communities better. An enlarged construction program in 1929 depends principally upon increased engineering work.

Heavy Construction Ahead of 1927

Total for 1928 Was $3,600,000,000 Against $3,253,766,000 in Year Before—Iron and Steel Building Gained 50 Per Cent

BY A. W. WELCH*

OF the seven billion dollars worth of construction contracts placed throughout the United States in 1928, about 50 per cent was for heavy structures. Heavy or engineering construction last year totaled about $3,600,000,000, compared with $3,253,766,000 in 1927.

The steadily mounting construction programs have become a continual wonder even to economists. It seems impossible that each year should continue to top the record of the year before, and it is rather logically predicted that this practice cannot continue indefinitely. In dealing with such a subject as this, however, size of a commodity rather than its value must be gaged. When the purchasing power of the construction dollar for a certain year, say 1913, is used as the basis of determining physical volume, it is found that the increase from year to year has by no means been excessive, especially when it is compared with the vastly increased production of other industries. Thus, although the money value of 1928 construction was 120 per cent greater than that of 1922, the physical volume of structures represented by the money is only 54 per cent greater.

One of the most important gains recorded in the past year was in the industrial building field. The year's figure for projects of $40,000 or more was $345,000,000, compared with $321,000,000 in 1927. The particular significance of this lies in the fact that industrial buildings and plant expansion are an important index of business confidence. When a corporation authorizes a new power plant or factory, or an extension to an existing one, it does so on the sound expectation of doing a larger volume of business. In authorizing facilities for the increased production of its product or products it must foresee larger markets. On the page following are the number and value of industrial building contracts in five important industries reported awarded in 1927-1928.

The remarkable agreement in plant expansion in these five industries is apparent in the total figures; both number and value are practically the same for the two years. In examining the individual industries it is seen that this same steadiness is evident in the public utilities and automotive fields. Value of contracts for iron and steel plants was 50 per cent more than in 1927, with four times as many projects.

The James River Bridge, a $7,000,000 Highway Link Across Virginia's Tidewater Flats, Is One of the Large Toll Bridges Recently Constructed. It is 23,170-ft. long, opening up a through route from Newport News to Norfolk and the South

Private Bridges Gained, Public Declined

Private bridge contracts awarded in 1928 exceeded the 1927 value

*Manager Business News Department, McGraw-Hill Publishing Co.

by some 15 per cent, while public bridges registered a decline of 18 per cent, giving an overall change of minus 7 per cent. This decline may be regarded as negligible in this era of large structures, particularly when it is remembered that the 1927 figures included the big Fort Lee-Fort Washington bridge over the Hudson River. Increase in private projects has been general except in New England and the Middle West, while the decrease in public

COMPARISON OF BUILDING CONTRACTS IN FIVE MAJOR INDUSTRIES

	1928		1927	
	Number	Value	Number	Value
Public utilities....	125	$68,000,000	120	$63,000,000
Automotive	210	38,000,000	214	31,000,000
Machine shops....	56	11,000,000	162	23,000,000
Foundries	28	5,000,000	15	20,000,000
Iron and steel....	120	18,000,000	29	12,000,000
Total	539	$140,000,000	540	$149,000,000

work has been equally general with the single exception of New England, where there was a 100 per cent increase. The following tabulation compares the 1928 figures with those of 1927 for the principal regions of the country.

Of the year's grand total for bridges, 12 projects totaled about $50,000,000, or nearly 40 per cent. The largest was the Waverly-Bayonne bridge over Newark Bay, of which the Bethlehem Steel Co.'s share is nearly $7,600,000. This company participated in the $5,800,000 superstructure of the Long View-Rainier (Wash.) bridge over the Columbia River. Other important bridges awarded were the Arlington Memorial at Washington, the Bayonne-Port Richmond, and others at St. Marys (W. Va.), Cleveland, Charleston (S. C.), New Brunswick (N. J.), Seekonk River from Providence to East Providence, and a Tennessee State highway bridge, each exceeding $1,000,000.

Large Pipe Lines Constructed

No mention of construction calling for large quantities of iron and steel can omit mention of the large pipe lines continually being awarded. One dozen of these let in 1928 totaled $45,000,000. Most of these were in the Southwest, especially Texas. Two from Tennessee to Louisiana cost $15,000,000. The largest, from Illinois to Texas, cost $15,000,000.

Not only was the 1928 volume of heavy construction greater than that of 1927, but this lead was maintained in every month of the year. There was no slackening. The characteristics of the past two years are much the same except for a sharp rise in October, 1928.

Confidence in Outlook for 1929

The construction year has closed as strongly as it opened. Economists and business leaders express confidence in general industry during the new year. Such confidence must be predicated on continued activity in the construction industry, as this industry is so interlaced with all others that it cannot weaken without causing a general slowing down. There are no indications that it will weaken. Two of the soundest proofs that it will not are: (1) that new capital for construction continues to issue in quantity and (2) that construction costs are stabilized.

BRIDGE CONTRACTS AWARDED IN 1927 AND 1928

	1928		1927	
	Private	Public	Private	Public
New England.	$165,000	$8,291,000	$5,025,000	$3,643,000
Middle Atlantic	9,556,000	27,927,000	4,075,000	34,746,000
South	12,264,000	14,775,000	2,300,000	23,278,000
Middle West..	3,707,000	23,806,000	7,806,000	38,222,000
West of Mississippi..	2,525,000	17,883,000	1,779,000	15,179,000
Far West	6,875,000	6,117,000	1,745,000	5,847,000
Total	$35,095,000	$98,799,000	$22,730,000	$120,915,000
	$133,894,000		$143,645,000	

Imports and Exports Worth Nine Billions of Dollars

A STEADY growth of American export trade to the highest volume attained since 1920 marked the course of 1928 foreign trade, according to a review of the year's world trade conditions by the National Foreign Trade Council. The council's estimate places our 1928 exports at slightly over $5,000,000,000, a gain of a little over 2 per cent over the preceding year. Owing chiefly to lower prices among some of our principal imports, 1928 American import trade totaled about 2 per cent less than that of 1927, and will amount to about $4,100,000,000. The anticipated export balance, which is indicated at about $900,000,000, will be the largest the United States has had since 1924, when the total amounted to $981,000,000.

The council's statement continues:

The outstanding developments for the year in American foreign trade have been this unusually high export balance and the very large proportion of manufactured goods among our exports. The anticipated balance in favor of exports is our highest since 1924 and the highest, except for that year, since 1921. But it should not be forgotten that American tourist expenditures abroad, now a potent factor in the real balance of our trade, have also been estimated at fully $900,000,000 for 1928, and thus practically equal our export trade balance. The high proportion of manufactured goods among our exports, over 70 per cent for 1928, adds a stabilizing factor to our trade, as these are the products that respond to American salesmanship abroad and are carrying us forward each year to new levels of progress.

Our export trade with South America also showed a 7½ per cent gain, where Argentina, as usual, led as a purchaser of American goods, with an estimated total of $160,000,000, almost 10 per cent better than in 1927. There was also a normal gain of about 7 per cent in American exports throughout Central America.

Canada again maintained its place as our best customer with purchases totaling over $800,000,000. This represents a purchasing habit of Canadians from the United States of practically $900 per capita, the largest per capita business done between any two large nations in the world.

Our exports to Europe remained with very little variation from 1927 and amount to just over $2,300,000,000, or 48 per cent of our export trade, in comparison with the excess of 60 per cent usually held before the war. The most interesting development of the year was the growth of our export trade with Russia by almost 20 per cent to close to $80,000,000, about twice our sales to Russia in 1913.

During the year German production attained again the levels in several vital particulars which the country had held before the war. According to present estimates, her 1928 production and export of steel equaled her 1913 ranking, second in world export and in world production only to the United States. Coal production has considerably increased above the 1913 output in present frontiers, and rail traffic, in million ton-kilometers, is about 33 per cent in excess of the corresponding volume in 1913. German export trade for 1928 is estimated to have reached a volume of about 85 per cent of pre-war exports and should attain close to parity with 1913 during the coming year.

Bright Automotive Outlook for 1929

Output May Exceed 1928 Record—Let-Live Buying Policy Looked for—Increased Exports Expected and More Mergers

BY NORMAN G. SHIDLE*

CONTINUED prosperity for 1929 seems certain for the automotive industry. Major increases in production and sales are not to be expected over the record-breaking year just passed, but it would not be at all surprising to see some increase.

In 1928 there were produced about 4,050,000 passenger cars and about 590,000 trucks. In 1929 these figures may indeed be increased, to perhaps as many as 4,115,000 cars and 635,000 trucks. This means a highly prosperous year for the vehicle manufacturers, continuance of profitable business in the parts and accessory fields and a volume of iron and steel buying for 1929 comparing favorably with that of the last twelve months.

The industry will have a considerable excess of production capacity in 1929, as it has had in 1928 and for several years past. The last twelve months have demonstrated, however, that profits can be made when the industry is operating at from 65 to 70 per cent of its capacity, and not only by the vehicle manufacturers themselves, but also by the suppliers and equipment makers selling to those vehicle makers. Consequently, the practical executives in the industry are not worrying nearly so much as the economists about the fact that the automobile factories are capable of building about 7,000,000 vehicles this year while their probable output will be nearer to 4,750,000.

Expect Exporting To Go On Apace

DOMESTIC sales during the next twelve months probably will exceed those of 1928 by not much more than 100,000 to 200,000, but it is expected that export markets will continue to develop at a rapid rate as they have been doing in recent years. Domestic retail automobile sales, as a matter of fact, were not so great last year as they were in 1926.

Despite a recent increase in price on certain Ford models, the general price tendency in the automotive industry has been downward, and the competitive outlook gives no reason to look for reversal of that trend during 1929. Sporadic increases in prices may occur, but generally speaking, stability in this respect is to be looked for.

Competition is going to be very keen in 1929; there is no blinking that fact. Among makers of cars selling for less than $800, particularly, there seems sure to be a real battle. Analysis of formally announced production plans of producers in this low priced field does indicate that one of three things must happen: Either cars in this group will comprise a far greater proportion of total production than ever before; or the total output of the industry itself must run over the 6,000,000 mark; or the current plans of one or more makers in this group must go awry to some extent. It is perfectly possible—perhaps probable—that what actually will happen is that a majority of the companies in this particular competitive group will do a good, profitable business without any one of them reaching quite the goal publicly set for itself.

The trend toward mergers, which has been so evident in the last year, gives promise of continuing. One or two more consolidations in the passenger car field would not be surprising in the next twelve months. Further combinations among parts and accessory units seem almost certain, not only because of the economies possible through such measures but also because of the opportunities for profit seen by various banking groups from engaging in the combining processes.

The used car situation continues to be difficult, but dealers have unquestionably handled their used car sales more intelligently and more efficiently in 1928 than in any previous year.

Where Future Economies Are to Be Made

CONTINUED strenuous efforts at cost reduction are to be expected throughout the industry as a result of the keen competitive struggle. Close scrutiny of production methods and costs as well as careful material buying is to be expected. The changes from past practice in these respects, however, are not likely to be nearly so great nor so intensively sought after as is better efficiency in marketing and distributing methods. There is a growing tendency on the part of automotive executives to recognize that their supply sources must get adequate profits if stability and quality of materials are to be guaranteed and it is fair to say that conditions have shown some improvement along these lines.

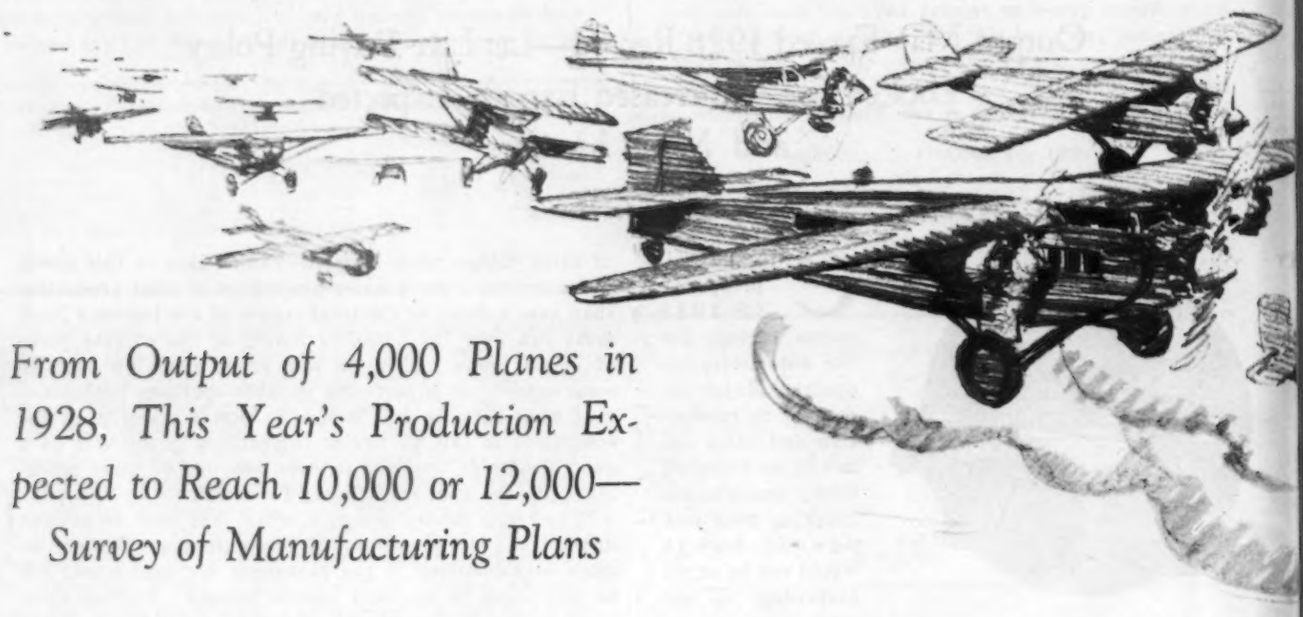
In the marketing end of the business, it is generally recognized that much remains to be done. Du Bois Young, president of the newly combined Hupmobile and Chandler-Cleveland organizations expressed concisely a general trend in automotive executive thought when he wrote recently in *Automotive Industries* as follows:

"What we need just now, perhaps, more than too close a consideration of further production economies, is study of means and measures for reducing distributing costs. It is a fine tribute to the capabilities of our production engineers and our tool and machine suppliers that such should be the case."

When the general outlook is bright and the business sky reasonably clear, there is relatively little to be discussed about the future of an industry. That is about the situation from an automotive standpoint at the moment. Naturally, the certainty with which good business and good profits are predicted for automotive firms in 1929 lies primarily in the general business picture as it applies to all industries.

*Directing editor, *Automotive Industries*, Philadelphia.

Aircraft Industry at Threshold of G



From Output of 4,000 Planes in 1928, This Year's Production Expected to Reach 10,000 or 12,000—Survey of Manufacturing Plans

ALTHOUGH Orville and Wilbur Wright made the first successful airplane flight 25 years ago, aircraft manufacturing in 1928 in the United States underwent an era of development surpassing that of any previous year, and today is at the point of assuming a position of major importance among the metal-working industries.

That aviation is passing from the experimental to the practical stage is shown by the great increase in the past year in airports, the growth of air mail and express service, and the rapidly maturing plans for passenger carrying on a large scale.

Output May Be Trebled in 1929

Aircraft manufacturing has made remarkable strides. From a production of 4000 planes in 1928, output for 1929 is expected to reach 10,000 or 12,000, with a corresponding increase in the manufacture of engines and accessories.

For many years the infant industry had been waiting for a new partner in its enterprise—the public. The successful flight of Charles Lindbergh to Paris started the ball rolling toward a tremendously accelerated development, in which the public has taken part with its money. The past year was one of refinancing and construction of new factories, and 1929 will be the beginning of another era—standardization and manufacturing on a production basis.

There has seemed to be no lack of capital for those companies which already had made a good record and which had a product that had stood the tests of flying. Moreover, many new companies whose plans are still largely on paper have found the means to get into production, and new plants will spring up all over the country this year.

Automobile Companies to Build Engines

Encouraged by the success of Wright, Curtiss and Pratt & Whitney in engine building, numbers of others have begun or are about to resume production, including such well known names in the automotive field as the Packard Motor Car Co., the Continental Motors Corporation and the Velie Motor Corporation. Foreign motors will be built here by the E. W. Bliss Co., the American Cirrus Engines, Inc., a new company, the Fairchild Caminez Engine Corporation and others.

Developments in airplanes have tended toward the all-metal or nearly all-metal craft. A large growth in the output of multi-motored planes was recently predicted by Henry Ford. Planes of large carrying capacity, such as the Keystone Patrician, seating 20 persons, recently completed by the Keystone Aircraft Corporation, Bristol, Pa., are sure to be built in larger numbers to provide for the expected increase in aerial traveling. Small sports planes, which are sold at no more than the price of a medium-class automobile, also seem destined to make up a considerable part of the 1929 output.

Manufacturing Now on Production Basis

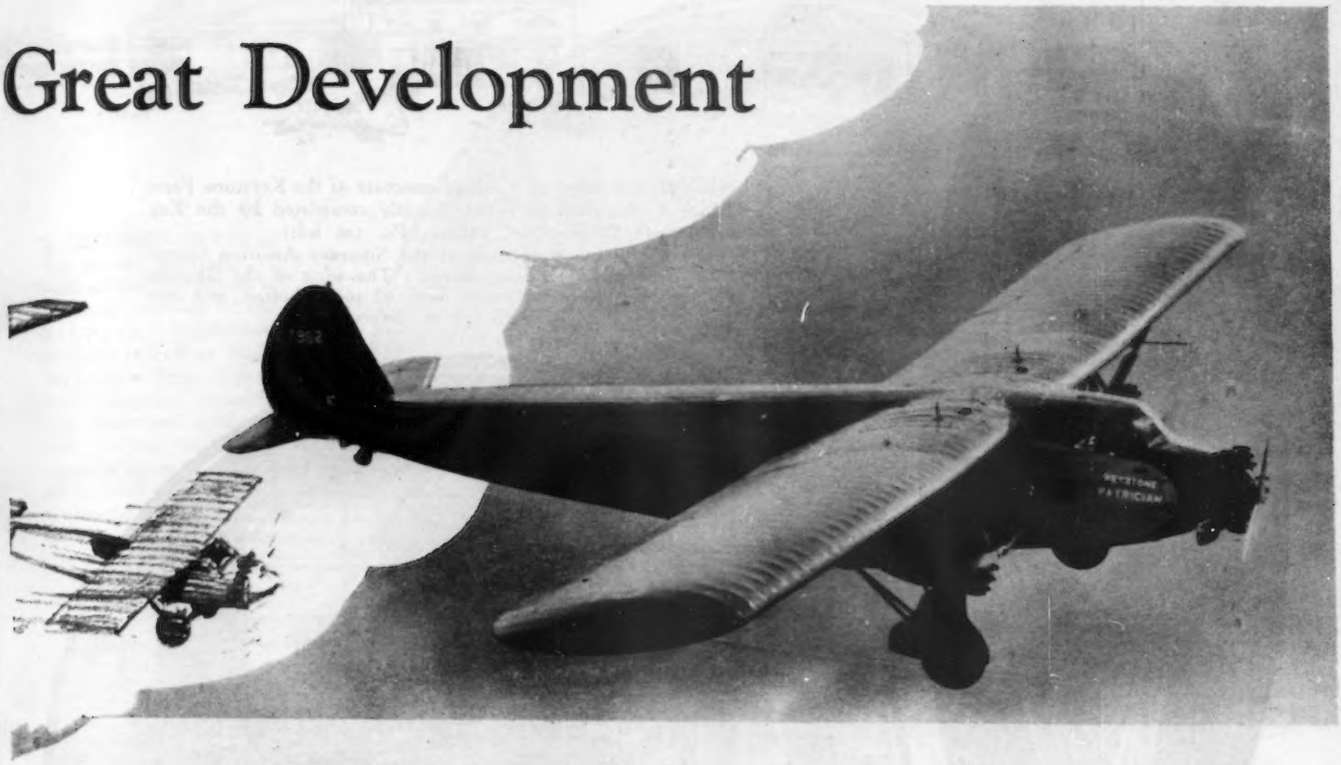
Production on a standardized basis, with assembly lines such as are found in the larger automobile plants, is being entered upon by such companies as the Fairchild Airplane Mfg. Co., Farmingdale, Long Island, and the Stout Metal Airplane Co. Division of Ford Motor Co., Dearborn, Mich.

In short, air transport and aircraft manufacturing are assuming the size and responsibility of big business, and only the application of sound business principles, as a bankers' publication said recently, are needed to make the aircraft industry rank as one of the country's great enterprises. Henry Ford has said: "Although we cannot foresee just what the development of aeronautics will be, we can be very sure that progress will be very rapid from now on."

A Struggling Industry Seven Years Ago

A recent survey by the Aeronautical Chamber of Commerce, New York, showed that aircraft production of all types in this country during 1928 had a total market value of about $75,000,000. Tracing the rapid growth of the industry, it stated that in 1927 less than 2000 planes were built, while in 1921, the year the chamber was organized, the total capital investment in the aircraft industry was not more than $5,000,000 and the several motor plants and the half dozen or so airplane factories were

Great Development



struggling to survive on meager Government orders. Commercial manufacture on a large scale at that time seemed remote, but at the recent Chicago Aeronautical Exposition more than 80 different types of commercial airplanes were displayed.

Lester D. Gardner, president Aeronautical Chamber of Commerce, in a recent statement sent to President Coolidge, said:

"The past 12 months have brought greater advancement in the manufacture and sale of aircraft than any like period since the peak of wartime production. Many factories are working to capacity and a general state of healthy prosperity is found throughout the entire field."

The Iron Age Surveys Aircraft Industry

In recognition of the growing importance of the aircraft industry to the metalworking field and to serve its readers who see in this industry an outlet for their products, The Iron Age has made an independent survey of the companies engaged in the manufacture of airplanes, engines and accessories. Output in 1928, scheduled production for 1929, plans for plant expansion and other data are given in the list which follows. Names of some companies which have recently been incorporated are omitted because of indefiniteness of intentions.

A

Advance Aircraft Co., Troy, Ohio. Production in 1928 was about 1000 airplanes. Whether this output will be increased in 1929 depends, the company says, on the supply of motors. Company has plans for expansion of plant and facilities during 1929. It was organized in 1921 and its officers are as follows: President, C. J. Brukner; vice-president, L. N. Brutus; secretary, L. E. St. John; treasurer, L. N. Brutus.

Aerial Service Corporation, Hammondsport, N. Y. Manufacturer of Mercury commercial airplanes and spare parts for aircraft. Officers are: H. Kleckler, president, and J. F. Meade, general manager.

Aero-Craft Mfg. Co., Inc., 1489 East Fort Street, Detroit. Manufacturer of airplanes, specializing in a small type, the Aero-Coupe.

Aeromarine Klemm Corporation, 1501 Broadway, N. Y. This company has been engaged for some years in the manufacture of starters and other aircraft equipment and is now getting into production on airplanes. It will manufacture the Klemm-Daimler Monoplane, which is a light plane of German design, and the number to be produced in 1929 will depend very largely on the orders received. The plant of the Aeromarine Plane & Motor Co. at Keyport, N. J., will be utilized. The company is headed by I. M. Uppercu, who is also president of the Uppercu-Cadillac Co. of New York, and other officers are: William H. Douglas, vice-president and general manager; John German, secretary; James Wright, treasurer.

Aeronautical Corporation of America, Chamber of Commerce Building, Cincinnati. Organized in 1928 to manufacture airplanes. Will start to build plant in Cincinnati immediately after the first of the year. Expects to get into production in April on a basis of 100 airplanes a year. Will be an assembly plant at first, but eventually company will make own engines and be a self-contained unit. Officers are: D. C. Keller, president; Taylor Stanley, vice-president; J. J. Castellini, treasurer; Robert Taft, secretary; C. J. Dietz, general manager.

Aeronautical Products Corporation, Naugatuck, Conn. New plant, with 40,000 sq. ft. of floor space, recently completed, and company has begun production of four-cylinder In-Line airplane engines. Its initial production is two a day, but output will later be increased, and the total for the year is estimated at 1250 engines. The company was organized in March, 1928; its officers are: H. Alex Johnson, president; C. S. Austin, secretary; Harris Whittemore, Jr., treasurer.

Aero Supply & Mfg. Co., Twenty-second Street and Third Avenue, College Point, Long Island. This company has been a manufacturer for a number of years of a complete line of screw products for the aircraft industry and is also a jobber of tubing, strip steel, brass, duralumin, copper wire and similar raw materials for aircraft manufacture. A consolidation with three other manufacturers, practically completed, will give the new corporation in the coming year three additional plants in Ohio and Pennsylvania. Officers of the company are: George I. Stich, president and general manager; E. W. Stephenson, vice-president; Guy Pomp, secretary; H. Kollmeier, treasurer.

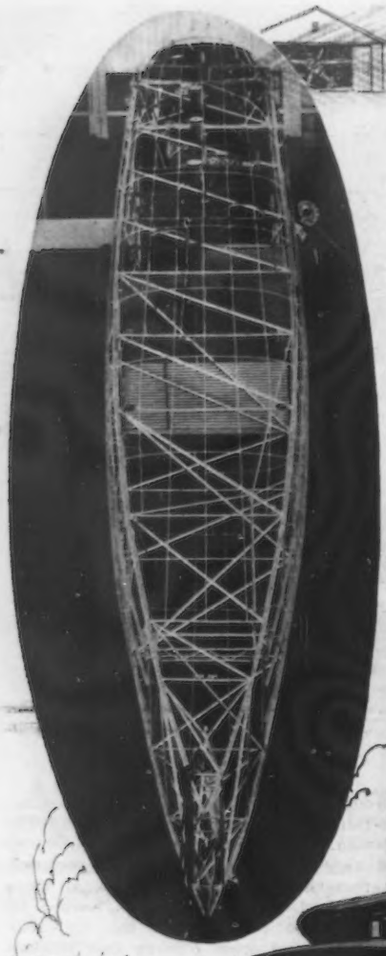
Aircraft Development Corporation, Detroit. Builders of all-metal lighter-than-air ships for the United States Navy. Officers include H. H. Emmons, president, and C. B. Fritsche, general manager.

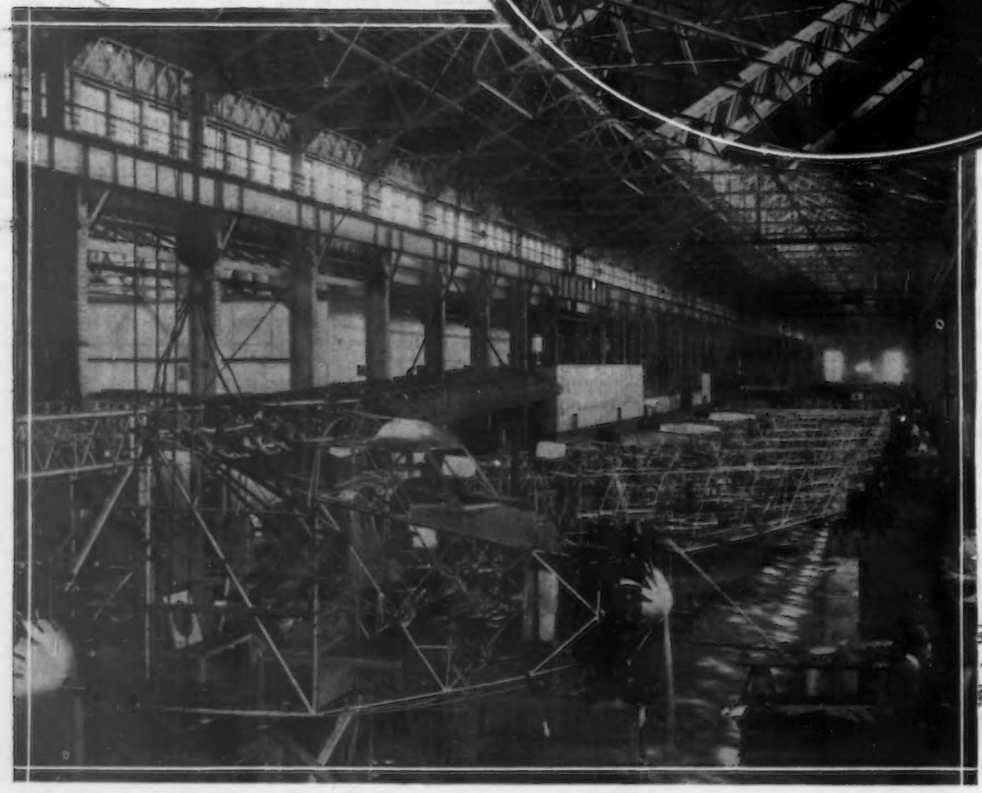
Aircraft Engine Co., Inc., 1709 East Twelfth Street, Oakland, Cal. Builders of aircraft motors known as the Comet. W. E. Wilson is president.

Aircraft Devices Corporation, 347 Madison Avenue, New York. This company assembles fuel pumps for gasoline aircraft motors at 150 Lafayette Street, New York. Plans for the

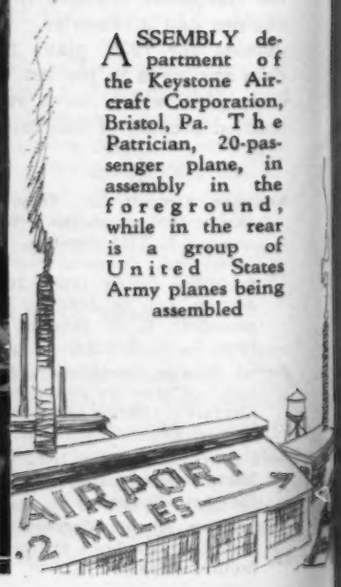
CHROME molybdenum fuselage structure of the Keystone Patrician, a 20-passenger plane recently completed by the Keystone Aircraft Corporation, Bristol, Pa. (at left).

Wing construction workroom of the Sikorsky Aviation Corporation at College Point, Long Island. The wing of the Sikorsky Amphibions is a metal structure, with all joints bolted, and covered with fabric (below).





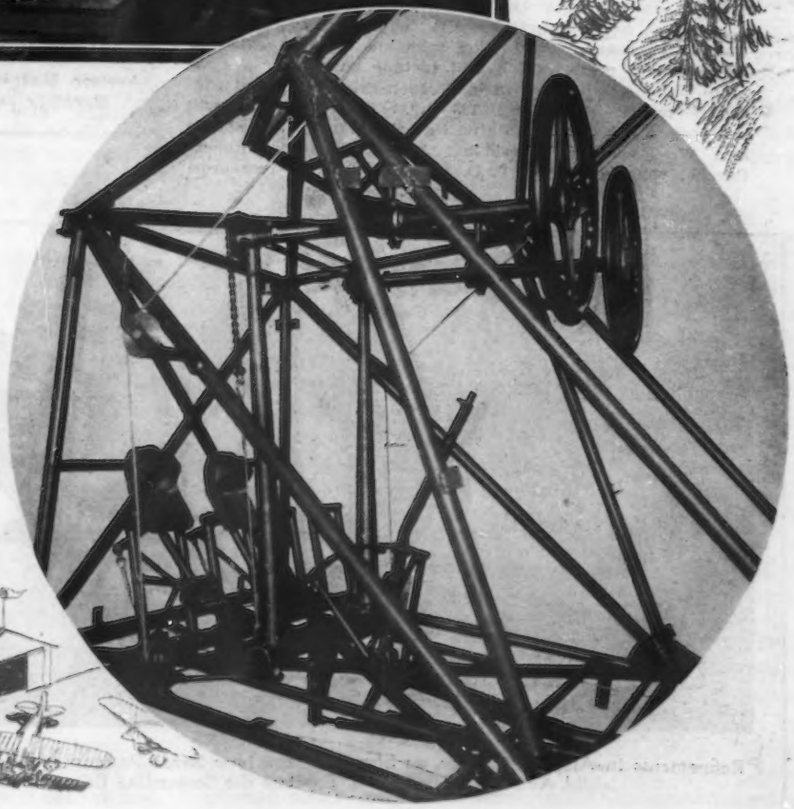
ASSEMBLY department of the Keystone Aircraft Corporation, Bristol, Pa. The Patrician, 20-passenger plane, in assembly in the foreground, while in the rear is a group of United States Army planes being assembled

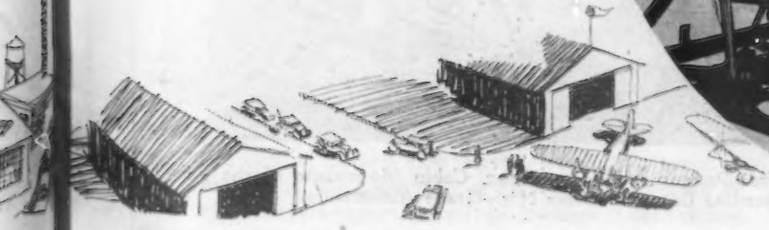


LUXURIOUSNESS of cabin interiors of some of the new planes is shown by this view of the Sikorsky Amphibion built for John Hay Whitney of New York. Equipment comprises a couch, four chairs and a cabinet with folding table top. Luggage space is provided forward of the pilot's compartment and toilet compartment is in the stern (at right).

ASSEMBLY department of a large airplane factory (above).

Metal structure of cockpit of a Stinson-Detroiter plane, showing the all-metal construction, including tubing, forgings and castings (at right.)





manufacture of parts by the company instead of under contract are being considered. Officers are: H. Moakley, president, and J. E. Diamond, vice-president.

Aircraft Holding Corporation, Los Angeles. Organized in September, 1927, to manufacture aircraft engines, company was not in production in 1928, but plans to begin assembling in 1929 with 300 engines as quota. Officers are: J. J. Murray, president; Sam B. Dunham, vice-president, and Agnes I. Murray, secretary.

Aircraft Industries, San Leandro, Cal. Organized in 1927, company produced 12 planes in 1928, but has not yet fixed output for 1929. Major Irwin is president.

Aire-Kraft, Inc., Washington, Pa. Manufacturer of airplanes, including cabin monoplanes. Bud Snyder, chief engineer and general manager.

Airships, Inc., Hammondsport, N. Y. In the past year this company has constructed two dirigibles, several spherical balloons as well as emergency flotation gear and safety belts for pilots; it has also delivered several hundred inflatable rubber boats for aircraft use and is also engaged in the manufacture of outboard motor boats, of which about 350 to 500 will be manufactured in 1929. Negotiations are under way for new financing, after which there will be an expansion of plant facilities. The company was organized as a partnership in 1920 and was incorporated in 1923. Its officers are: J. Lansing Callen, president; Beckwith Haven, vice-president and treasurer; J. F. Boyle, secretary.

Air Transport Equipment, Inc., New York. This company is engaged in the manufacture of supplies for the aviation industry, and its production schedule for 1929 contemplates an increase of about 20 per cent; its production facilities will be correspondingly enlarged. The company was organized in 1920 and its officers are: Alexander A. Pedu, president; M. Baumann, vice-president.

Airways Mfg. Co., Ninth and Spring Streets, Los Angeles. Manufacturer of airplanes.

Alexander Aircraft Co., Colorado Springs, Colo. Produced and sold 570 Eaglerock airplanes in 1928, and its 1929 schedule calls for the production of 1550 of the same type plane. In 1928, the company built in Colorado Springs one of the largest commercial aircraft factories in the country and this year it will expand the factory facilities and erect an administration building. The company was organized in February, 1926, and its officers are: J. Don Alexander, president; D. M. Alexander, vice-president; R. A. Duncan, secretary-treasurer; J. A. McInaney, sales manager.

Alliance Aircraft Corporation, Alliance, Ohio. Company, organized in January, 1928, not yet in production, but will be ready soon to begin the manufacture of airplanes and engines. A new plant, 60 x 300 ft., will be ready for operation in February. Production schedule for 1929 calls for 500 complete units, which will include the Argo, a two-place biplane, equipped with a seven-cylinder, radial air-cooled motor, developing 125 hp. The company will manufacture the engines as well as the planes. Its officers are: W. E. Trump, president; A. W. Hess and Robert Purcell, vice-presidents; T. D. Russell, secretary-treasurer.

Allison Engineering Co., Speedway, Indianapolis. Engaged in the repair and rebuilding of Liberty motors for the United States Government. James A. Allison is president.

American Aeronautical Corporation, 730 Fifth Avenue, New York. Company contemplates the manufacture of 100 seaplanes under Savoia-Marchetti patents during 1929. Officers of the company are: Enea Bossi, president; Paul G. Zimmermann, vice-president; Albert Kapteyn, secretary-treasurer.

American Cirrus Engines, Inc., Belleville, N. J. Company has just been organized to manufacture under license in this country the Cirrus aviation engine, a British product. Plant at 752 Washington Avenue, Belleville, N. J., has been taken over for manufacturing and equipment will soon be purchased and installed. Temporary office of company is at 84 William Street, New York, which is also the address of Campbell, Peterson & Co., investment bankers, who are handling the financing of the company. A. G. Lloyd is production manager and G. G. De Witt is purchasing agent.

American Eagle Aircraft Corporation, 2800 East Thirteenth Street, Kansas City, Mo. Production in 1928 was 410 airplanes, bringing the company up from seventeenth place among American airplane builders to among the top three. Its 1929 production schedule calls for an output of 1200 to 1500 airplanes in five types, ranging from a small folding wing sports biplane for two passengers to a twin motor, six-place cabin monoplane, the various types selling for a minimum of $1,895 up to $17,500. Company has recently completed a $1,000,000 expansion program, which included the erection of a modern factory at Fairfax Airport, Kansas City, having total floor space in excess of 80,000 sq. ft. This factory is the fourth company has occupied in less than three years. The American Eagle Aircraft Corporation was organized in the fall of 1925 by E. E. Porterfield, Jr., who at that time was operating the Porterfield Flying School, Inc., a pioneer in that field in the Middle West. The first year he planned to build 25 planes, but by fall had built and sold 82. A reorganization of the company and the seeking of larger manufacturing space were recently necessitated by the growing demand for its planes. Officers are: President, E. E. Porterfield, Jr.; vice-president and treasurer, D. L. Chick; secretary, M. L. Bogie.

Arkansas Aircraft Corporation, Little Rock, Ark. Produced 85 Command-Aire aeroplanes in 1928, and contemplates a total production of 1000 planes in 1929. Company says that its plant is sufficiently large for increased production, but new shop equipment probably will be required. Company was organized in March, 1928, and its officers are as follows: R. B. Snowden, Jr., president; C. M. Taylor, second vice-president; W. F. Moody, secretary-treasurer.

Arrow Aircraft Corporation, 1424 O Street, Havelock, Neb. Manufacturer of small commercial airplanes.

Axelson Machine Co., 6100 South Boyle Avenue, Los Angeles. Recently acquired manufacturing rights to Floco airplane

(*Continued on page* 110)

Refinements in Airplane Design, as Shown by the New Seven-Passenger, Folding Wing, Cabin Monoplane of the Fairchild Aviation Corporation, Emulate the Streamline Effects of Some High-Grade Automobiles

Promise of Latin America in Exports

Market for Iron and Steel Products, Not to Mention Hardware, Looms Large, with Expansion Based on Quality and Service Factors

BY LUTHER BECKER

PRESENT consumption of iron and steel works products in the whole of Latin America probably exceeds 3,000,000 tons, an impressive figure when compared with other important world areas, such for example as the Orient. Of this total but a very small portion originates in the countries making up this territory, the bulk of the demand being supplied by the United States, Germany, Great Britain, Belgium, Luxemburg and France.

Mexico, the only important steel-producing country in the group, with abundant resources in rich iron ore and coking coal, has an iron and steel mill at Monterrey capable of turning out over 100,000 tons of raw steel a year, which is rolled into rails, plates, shapes, bars, wire rods, and wire products.

Luther Becker is chief of the Iron and Steel Division, Bureau of Foreign and Domestic Commerce, Department of Commerce

Nail Making and Sheet Galvanizing in A B C Countries

VARIOUS attempts have been made in Argentina, Brazil and Chile to foster iron and steel industries, but to date little headway has been made, largely due to the lack of coal as a fuel for blast furnaces. Manufacture in these countries has, therefore, been restricted to pig iron for local foundry use and for the open-hearth and electric furnace for further manufacture of raw steel, which is rolled into reinforcing and merchant steel bars and light shapes.

In all three of these countries wire nail factories are adequately equipped to supply a large part of the local needs of this article. The nail wire from which these nails are made, however, comes from the outside.

Galvanizing plants in each of the A B C countries provide practically the entire requirements in galvanized sheets, and Argentina alone will consume over 80,000 tons of both plain and corrugated galvanized sheets for roofing and siding purposes, for grass-hopper barriers, signs, utensils, etc. Here again the imported article in the form of the black sheet makes this thriving industry possible, and to protect the local industry in the Argentine an import tariff of about $34 a ton is charged against the foreign galvanized product.

Chile is rich in iron ore of excellent quality and thus far has exported the builk of its production to the United States, but if present plans for an iron and steel company are fulfilled, a part of this ore will be used at home. Brazil is likewise blessed with abundant supplies of good quality iron ore, but sends very little of its production outside of the country. Practically all of the manganese ore mined in Brazil finds its way to the United States, Great Britain and Continental Europe. A recently organized company in Brazil plans to utilize its ore for the manufacture of iron and steel and export a small percentage of that mined.

Demand Comparable to That of Orient

THE Orient as a territorial group will consume a considerably larger volume of iron and steel products when we consider the demands of such populous and industrial countries as Japan, which normally consumes 2,500,000 tons a year, or China and India, accounting for a million tons each, or the Federated Malay States, Netherlands East Indies, Siam, and the Philippine Islands, which combined take upward of a half million tons.

Japan, however, is nearly self-contained in respect to steel and provides for its own needs up to 80 per cent of the total consumption. British India, with steel-making capacity of 800,000 tons of ingots, is practically self-sufficient on rails and tin plate and meets its own requirements to a considerable extent in bars, light shapes, plates and other steel materials. In China very little progress has been made in the field of steel production, which at the present time is limited to bars and light shapes. Chinese blast furnaces have for a number of years been smelting ore largely for Japanese consumption, but since the disturbances in that country these have ceased to operate. Some day, however, the Chinese may be expected to enter the field seriously in both iron and steel manufacture, for they possess both ore and metallurgical coal in sufficient volume to warrant operations for many years in the future.

If, then, we subtract from the figure representing the combined consumptive demand for iron and steel products in the Orient, which can be conservatively placed at 5,000,000 tons, the volume produced locally in the three countries indicated, or about 2,000,000 tons, we arrive at a figure comparable to the tonnage consumed in Latin American markets. In other words, the markets to the south of us offer sales prospects on a scale comparable with those obtaining in these age-old Oriental fields which have been years in developing along industrial lines. Moreover, while certain of these Oriental countries are likely to see still greater expansion in the production of iron and steel products, and perhaps in time approach more nearly a degree of self-containment, the time is far remote when we may expect to find a duplication of this situation in the iron-bearing countries to our south.

Nature of the Increasing Demand

THE promise of Latin America as a market for iron and steel products lies in the direction of the remarkable development in these important steel-consuming industries: Railroad, mining, agriculture and manufacturing. Mexico, Cuba, Brazil, Argentina and Chile have accomplished much in all of these, while Bolivia, Colombia,

Venezuela and Peru have progressed mainly in railroad, mining and agricultural pursuits. In Uruguay and Ecuador development has been more in the fields of railroad transportation and agriculture than mining. In other countries in this group, particularly in Central America, the pursuit of agriculture plays the principal rôle. Manufacturing is, of course, pursued to a greater or less extent in most of the Latin American countries, but reaches its highest development in those of the first group.

It is readily apparent to one with a knowledge of the requirements of similar industries in the United States that practically every product made by the iron and steel industry finds a need in every one of these Latin American operations, and he can visualize the actual trading possibilities held out by these rapidly expanding markets. Industrial pursuits of the character described here provide opportunities, as at home, for a far wider range of steel manufactures than those falling strictly within the category of iron and steel works products.

For example, in railroad construction and operation, besides rails and accessories, crossings, steel cross ties, etc., for track, there is a need for fabricated structural steel for bridges, sheds and warehouses, for steel water tanks, and similar equipment turned out by shops having usually no part with a steel mill.

In the field of mining, mention might be made of such commodities as wire rope, mining tools, tool steel, aerial tramways, transmission towers, and in agriculture a list of manufactured steel goods would comprise tin cans, box strapping, and the usual run of steel buildings, bridges, tanks and Deauville track.

Manufacturing enterprises of the engineering variety, for example, structural steel fabricating shops, of which there are a number in South America in particular, equipped for the construction of the largest steel frame buildings required in those parts, and bridges as well, require mechanics' tools, small tools, chain hoists, vises, and similar appliances. Machine shops, nail factories, iron and steel foundries, brass foundries, textile mills, shoe factories, and a multitude of other manufacturing enterprises abound in practically all of the South American countries, in Cuba, Porto Rico, Mexico and Panama, which in combination consume a sizable volume of miscellaneous iron and steel manufactured goods.

To go a bit farther afield, but still keeping within the range of iron and steel manufactures, sight should not be lost of the trade prospects in a number of Latin American markets of so-called hardware and allied products. A list of the more important categories and items would include: builders' hardware, hand tools, plumbing fixtures, screwed pipe fittings, kitchen ware, cutlery, machetes, cooking stoves, lamps and lanterns, wood screws, safes and vaults, scales and balances, steel office furniture, and domestic and industrial oil burning equipment. Modern building construction in South America, in particular, is calling more and more for such equipment.

Past Participation of United States

WERE it possible to obtain complete figures to show the participation of each steel-producing country in the import trade of each Latin American market, a study of this trade would disclose some interesting facts. On the basis of existing data indications are that the United States led in 1927 in the export of iron and steel products to the whole of Latin America and that Great Britain and Germany held about equal ranking, with Belgium-Luxemburg occupying fourth position, and France a poor fifth.

In the case of the Argentine, the largest buyer of steel products in all Latin America, Great Britain, with sendings in 1927 of 279,910 gross tons, outstripped Germany, Belgium-Luxemburg, and the United States, which sent 206,318, 172,022, and 82,380 tons, respectively. Germany led in that year in the trade with Brazil with 103,754 tons, as compared with 70,633 tons for the United States, 56,156 tons for Great Britain, and 32,384 tons for Belgium-Luxemburg. Chile, the third largest buyer of steel products and ranking next to Brazil, purchased the largest share of its 1927 receipts from the United States, amounting to 44,641 tons, with Great Britain (28,715 tons), Germany (24,253 tons), and Belgium-Luxemburg (2,575 tons) following. Latin America in 1927 received 605,152 tons of strictly iron and steel works products from the United States, and distribution was practically complete covering twenty-eight individual markets. Our ten leading markets were, in order of listing, Cuba, Argentina, Mexico, Brazil, Colombia, Venezuela, Chile, Peru, Panama, and Uruguay, with tonnages ranging from the high of 92,486 for Cuba to 11,393 in the case of Uruguay.

Several Reasons for Expecting Expansion

THERE is every reason to believe that with the steady expansion in all branches of industry in this large and productive area, with the resulting enhancement in purchasing power of its people because of this growth, there will be a progressive increase in the demand for iron and steel manufactures, and that in the coming years the United States will participate in even greater measure than in the past.

Competition from European steel mills in this area is extremely keen, and although at the moment we may not be getting our share of the heavier forms of steel products, such as bars, shapes, plates and rails, and certain wire products, like wire nails and barbed wire, nevertheless we are selling these in places where superior quality and service count for more than mere price. American black and galvanized sheets, tin plate, and tubular goods find particular favor among the consuming public in Latin America, as they do in other sections of the world.

When a sheet is desired for working-up purposes, where forming and bending is necessary for such uses as enameled ware, automobile body sheets and the like, the American brands are preferred over all others. Similarly, because of the steel sheet base in our tin plate, it is also regarded as a superior article and American manufacturers find no difficulty in obtaining a premium over other brands from discriminating buyers. In the case of tubular products, American skelp is preferred because of its superior welding qualities, and where bending or forming of the pipe is desired the domestic article has an outstanding reputation.

American manufacturing exporters enjoy an enviable record everywhere among buyers of steel products in respect to service, which has enabled our people to win and maintain trade against the keenest kind of competition. Strict attention to the needs of the consumer has won for our exporters a reputation for packing.

The American exporter needs to supplement these indispensable features in the direction of better distributing facilities in the foreign markets themselves through more complete direct representation and through a more careful selection of distributers. More frequent visits by experienced executives to agents, who require direction and support, would go a long way toward increasing sales, particularly in backward markets.

It is also important to remember that steel goods lend themselves well to brand names carrying an appeal to the ultimate consumer, and when a branded article is once established, it is difficult to uproot it. Therefore, bending every effort toward maintaining the supremacy won in Latin America through a strict adherence to service and the delivery of only quality goods within the time specified, and enjoying the advantage of proximity to these markets, the promise of even greater opportunities than in the past lie just ahead.

Steady Advance in Dirigibles

Experience Indicates That Great Strength and Power Is Needed to Withstand Storms, This in Turn Requiring Great Size to Lift Structure, Crew and Cargo

BY JAMES WORK AND JOHN F. HARDECKER*

YEARS of painstaking technical development frequently attract but passing notice of the man in the street, until that development is climaxed by some dramatic incident. Then the whole world talks about it. Colonel Lindbergh's trans-Atlantic flight did this for the airplane and in like manner the recent round trip of the Graf Zeppelin drew world attention to the rigid dirigible. Fortunately such spectacular occurrences do more than arouse momentary enthusiasm and admiration—they provide the stimuli that hasten developments beyond the dreams of the fondest proponents of that particular science. The airplane owes much to Colonel Lindbergh's flight, but its greatest indebtedness is to an accelerated commercial development that has crowded many normal years of progress into one. The question is whether we can hope for as much for the airship.

Before we attempt to discuss that question, let us examine for a moment one peculiar phase of the airship problem. Technical development in nearly all modern fields of progress is associated with commercial applications of that development in terms of mass production, this in turn forming the financial foundation upon which to build future progress. No matter how crude the beginning, early progress is usually sufficient to attract a public demand for the applications of that development. Thus further and more noteworthy progress is financed.

Graf Zeppelin Flying Over the Wilhelmstrasse in Berlin Just Prior to Its Trans-Atlantic Voyage. (Wide World Photo)

But the airship in attaining its present stage of development is practically unique, because it has never been actually "commercial." True, Zeppelins did carry passengers in Germany almost from their beginning, while the Graf Zeppelin had a regular complement of paying passengers in both directions on its recent flight, but even these practical demonstrations do not fall within the scope of commercial activity which directly finances further development. The rigid airship, except insofar as similar parts for a single ship or small group of ships are concerned, falls at present beyond the realm of mass production, because it has not yet financially established itself. Yet despite this handicap its development has been unparalleled in modern transportation history.

German Ships Date Back 30 Years

First serious consideration of the problem was undertaken by Count Ferdinand von Zeppelin, who in 1898 employed two engineers to assist him to design and construct a rigid airship. The first ship had an aluminum and wire framework, approximately 400,000 cu. ft. gas capacity, 416 ft. long and 38 ft. in diameter, powered by two 16-hp. motors, and with a top speed of 17 miles per hr. The first flight was made on July 2, 1900.

The next ship was built in 1905 and was similar to the first, excepting the structure was developed a little more efficiently, eliminating some of the weight. It was powered with two 85-hp. engines and had a ceiling of less than 2000 ft. The third ship was built in 1906, and had a great number of control surfaces, as trouble was being experienced in maneuvering the earlier ships. With a top speed of 28.8 miles per hr., this made a record flight of 8 hr., covering 218 miles. The next ship was brought out in 1908, with a capacity of 530,000 cu. ft., and powered by two 100-hp. gasoline engines.

The greatest external change in the "Zeppelins" built up to 1915 was in the tail structure. This kept getting more and more complicated until, apparently borrowing from experience with heavier-than-air craft, a complete reversion to a simple system of monoplane elevators, rudders and fins took place. Internally the structure was becoming more and more refined and tended toward one general type of design. The greatest factor in this latter development was the introduction of duralumin in 1910. This alloy largely reduced the structural weight, and consequently increased the useful carrying capacity. During this period various attempts had been made to improve the gas cells, with the final introduction of goldbeaters' skin. This greatly improved the performance and cruising range, as it reduced the diffusion of gas outward and air inward and thus maintained the purity. The external shape was also gradually changed to the present stream-like form.

Entrance of the Schutte-Lanz Co. into the field in 1908 had a marked effect on Zeppelin ships. The first Schutte-Lanz ship had a volume of 724,000 cu. ft., a length of 430 ft., with a diameter of 60.3 ft., and carried a useful load of 10,000 lb. It had a reported speed of 42 miles per hr. with two 250-hp. engines. Even though this was its first ship, it was notably better than any corresponding Zeppelin. The second ship was an improved type, having a capacity of 883,000 cu. ft. and a speed of 55 miles per hr., being driven by four 180-hp. Maybach engines.

Besides remarkable advances in general shape and detailed construction made up to 1911, the size of the ships had grown from 400,000 to 900,000 cu. ft., their power

*James Work is project engineer (lighter-than-air craft) and John F. Hardecker is chief draftsman, both at U. S. Naval Aircraft Factory, Philadelphia.

from 32 to 840 hp., their speed from 17 to 55 miles an hour and their percentage of useful load to gross lift from 10 to 40. The march was steadily toward increased efficiency, without sacrificing reliability in any way.

The next few years marked the high tide of airship production. Such a large number of ships were built that a steady increase in the size, cruising radius, speed and ceiling was effected. In 1915 the resources and patents of both the Schutte-Lanz and Zeppelin companies were combined and resulted in a composite design known as the "Super-Zeppelin."

Post-war history of German airship manufacture is that of four ships, the Bodensee, the Nordstern, the ZR-3 (Los Angeles), and the Graf Zeppelin. The outstanding feature of the first two was great efficiency in small sizes. The other two will be described later at length.

British Construction Lagged Before the War

Although German technicians claim that all British lighter-than-air ships are due to German influence, the British built a ship in 1911 called the "Mayfly," which was in advance of its foreign contemporaries. This ship had a very good form with an advanced arrangement of car and machinery. Its capacity was 700,000 cu. ft. and it was powered by two 200-hp. engines. On her first trials she was moored by the nose to a floating mast and stayed there for three days, riding out a small gale. Thus the British first moored an air-ship at a mast.

Interest lagged until 1913, when airship activities were transferred from the army to the navy and a contract let for the R-9. Work on this ship proceeded slowly until 1915 when work was suspended, as it was thought the war would end shortly. But when enemy airship activities became so marked, the British proceeded with feverish haste to make up the lost time. They tried wooden construction, as duralumin was unavailable. After inspecting the hulk of the captured L-33 they realized that their early ships could not cope with such craft, so they adopted the R-33 class (briefly described in the accompanying table) and built several of these. R-38, their last ship of this series, which came to grief in its trial flights, represented the culmination of this strictly war-time experience.

The continuous history of this rigid airship development up to the immediate present is best shown by the appended table. It shows that the rigid airship, despite the lack of true commercial development financed from its own profits, nevertheless progressed rapidly, even before it was accelerated by war-time necessity and military demands.

Shenandoah Only Rigid Airship Made in America

Our own rigid airship construction is confined to the U.S.S. Shenandoah. Utilizing the German L-49 as a background for her design, she was truly a "Queen of the Skies" until her final voyage. The Shenandoah was fabricated at the Naval Aircraft Factory, Philadelphia, and assembled at the Naval Air Station, Lakehurst, N. J. Started in 1921, she was launched in July, 1923, and made her maiden flight in September, 1923. After an unsurpassed achievement of record flights, including one to the West Coast and back in 1924, she was wrecked over Ohio in September, 1925, when she was caught in a thunder storm of great violence. Her brief history convinced the Navy Department of the practicability of the rigid airship for certain specialized duties, and the circumstances surrounding her loss stressed the need of ships with greater speed and power to avoid fast-moving storm areas.

The U.S.S. Los Angeles, built by the Zeppelin company and flown to the United States in 1924, has been operated continuously by the U. S. Navy in demonstration flights to illustrate the practical probabilities of rigid dirigibles for commercial work. By the terms of the agreement under which we received this ship, she cannot be used for military purposes, and her use as an adjunct to the Navy has necessarily been very limited. Forbidden to engage in fleet maneuvers, her use has been practically limited to mail carrying and training flights. Including two flights to Bermuda, one to Porto Rico and the Virgin Islands, one to Panama, and a number of long journeys inland, she has made over 160 flights since coming from Friedrichshafen, Germany. With a length of 656 ft., diameter of 91 ft. and gas capacity of 2,625,000 cu. ft., she is better designed to stand the buffeting of heavy winds than was the Shenandoah. She is equipped with five 400-hp. Maybach engines, against the Shenandoah's five 300-hp. Packards, thus assuring her of greater power and speed to avoid or drive her way through storm areas. Unlike the Shenandoah, whose accommodations were most meager, she is equipped to carry 20 passengers and the officers and crew in great comfort.

Features of Construction of the Graf Zeppelin

Graf Zeppelin, victor in tremendous battles with the elements during its flight from Germany to the United States and return, is the latest in commercial dirigibles. It was built with the sole intention of furnishing proof of the practicability of trans-oceanic flights by rigid air craft. Since it embodies all the experience gained by the construction and operation of 126 large airships of the same type, the Graf Zeppelin is expected to establish in the minds of the general public and particularly of financial people, the same confidence in the future of dirigibles that the builders possess.

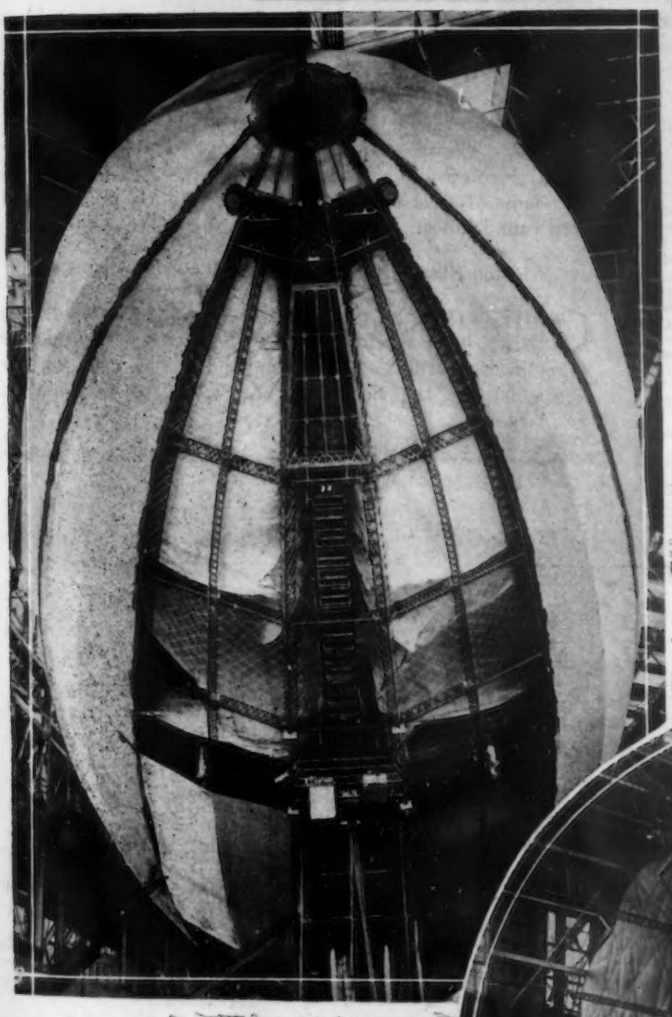
The actual dimensions of the Graf Zeppelin are 776.24 ft. in length, 98.44 ft. in diameter and 110.56 ft. in height above the cabin floor. The rated gas capacity is 3,708,043 cu. ft. Pay load is about 15 tons (20 passengers and 12 tons of mail or freight); cruising radius is about 6000 miles at an average speed of 65 to 75 miles per hr.

The first outstanding characteristic of the design is the use of an improved type of duralumin, 20 per cent stronger than that used in the Los Angeles. When we consider that this metallic skeleton is the size of a giant ocean liner, but weighs no more than a small sized harbor tug, we can appreciate the value of this improvement.

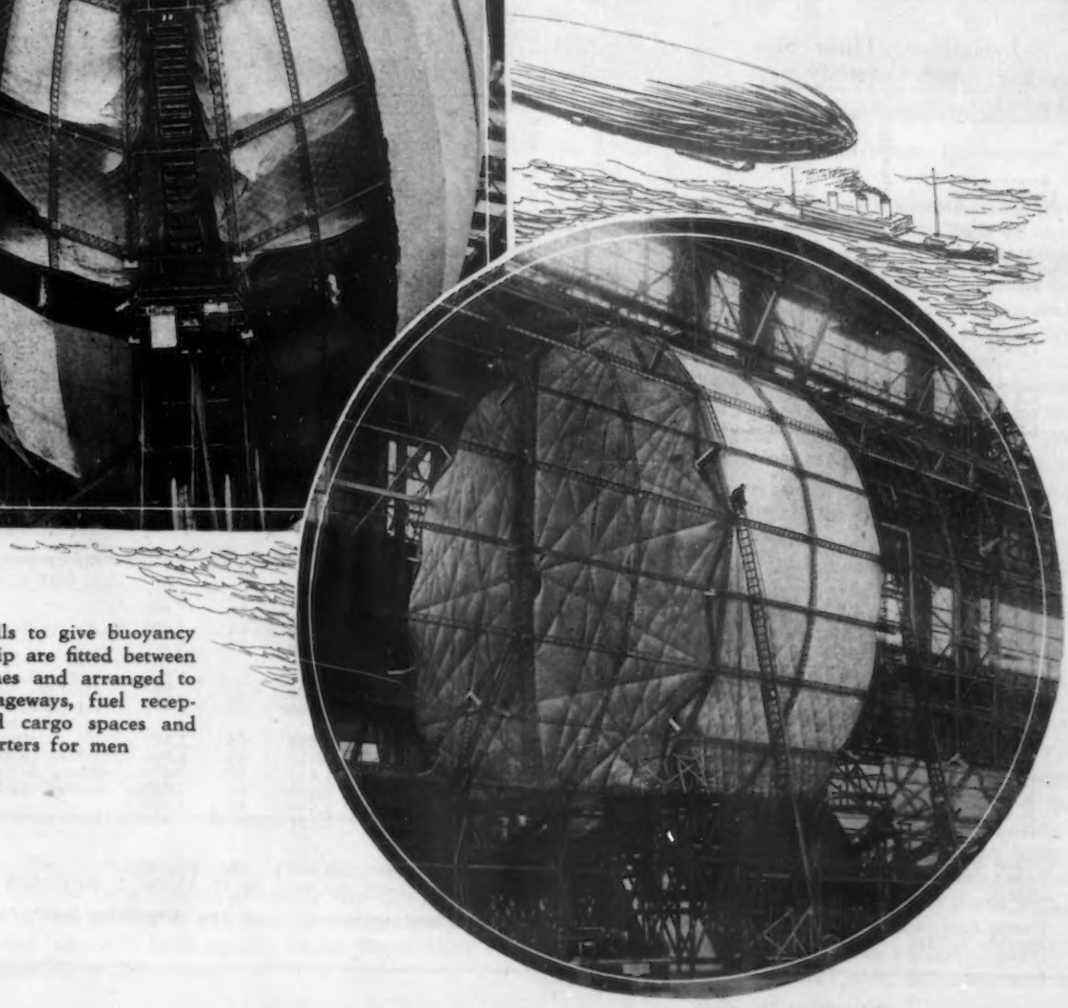
A second feature is an axial corridor, just below the center line of the ship, running fore and aft through the entire length. Besides functioning as an important operating gangway, it acts as a support for the sixteen transverse bulkheads, and thus contributes greatly to the strength and safety of the ship.

Third is in the arrangement of the gas cells, due to the use of fuel gas instead of gasoline for driving the engines. In order to make room in the interior for the storage of that fuel, the lifting gas cells in 12 of the 17 compartments occupy only two-thirds of the space, thus leaving room for 12 other gas cells which hold the fuel gas. This fuel gas has approximately the same weight as air, so there is no need for elaborate provisions to overcome the excess lift caused by the consumption of tons of gasoline on an extended flight. Since the fuel weighs the same as air, it makes no difference to the lifting force of the airship whether the fuel is on board or not, or whether the ship is just starting on a flight or returning from a long cruise. The trim of the ship also remains constant even though all the fuel is drawn from one location in the ship; the constant pumping of gasoline to maintain an even keel is thus eliminated.

A fourth improvement is the great reduction of stresses due to the absence of the heavy concentrated loads of fuel. The Los Angeles, for instance, carries 30 tons of gasoline slung inside her keel. Imagine the inertia of such a weight trying to tear loose from the airship tossed about in a storm, and you can appreciate the increase in safety. Fuel gas being no heavier than the air, has practically no weight at all.



CONSTRUCTION of a rigid airship requires precise manufacture of unit members, trial assembly of main frames in substantial jigs, and erection in hangar of exceptional size. Nose construction (at left) requires strong reinforcement to withstand mooring stresses.



GAS cells to give buoyancy to ship are fitted between main frames and arranged to clear passageways, fuel receptacles, and cargo spaces and quarters for men

The fifth improvement is in the reduction of fire risk, for an accidental mixture of the fuel gas with air is less flammable than gasoline fumes.

The sixth improvement results from the fact that it is possible to carry a much greater amount of energy in gaseous fuel than can be taken as gasoline. This means greater cruising radius. The fuel gas used by the Graf Zeppelin is known as Blau gas, being perfected by Dr. Herman Blau at Augsburg, Germany.*

British Use Stainless Steel and Diesel Engines

This brief account traces the development of rigid airships from the beginning. The present situation is but a phase, for other airships now are almost ready to embark on their maiden voyages or the plans for their development and financing are well under way.

In this category are the British R-100 just completed by the Airship Guarantee Co. at Howden, England, for trans-Atlantic flights between Great Britain and America, and the R-101 under advanced construction at the Royal Airship Works at Cardington, England.

The general requirements of these airships were a capacity of 5,000,000 cu. ft., a minimum speed of 70 miles per hr. at a height of 5000 ft., and a cruising range without refueling of about 4000 miles, carrying an ordinary commercial load at 63 miles an hour. Subject to these general conditions, the designers of the two vessels have been given a free hand, and as a consequence the two vessels have many important points of difference. They are alike in being fitted with living accommodations for one hundred passengers (eventually, if not at first) and for a crew of about fifty. With characteristic British thoroughness, the ground organization in personnel, hangars, bases and mooring masts is being expanded to provide for the operation of these huge new dirigibles. The R-100 will use gasoline for fuel, while the R-101 will use heavy oil.

The R-100 is being constructed of duralumin in accordance with current general practice. R-101, however, will use approximately equal amounts of stainless steel and duralumin in her structure. This will be of extreme interest, as the corrosion of duralumin is a serious problem which has not been entirely solved. These two metals are being used together, as, for example, the main longitudinal girders of triangular cross section are composed of three tubular steel booms held apart by tubular struts of duralumin. Again, the main transverse frames are composed of composite members, each built up of three tubular booms of steel united by webbing of duralumin pierced with round holes.

*Blau gas is the product of an oil-cracking process operating at 550 to 600 deg. C., and thus is different from the gas given off at higher temperatures, known as Pintsch gas and used for lighting old-fashioned railroad coaches. Blau gas is also richer in heat content, having about 1800 B.t.u. per cu. ft. Its specific gravity, compared to air, is 1.08. The fuel gas used for the return trip was bought under the specification: specific gravity, 1.03 to 1.08; heat value more than 1700 B.t.u. It was made by distilling off the heavier constituents of Kentucky natural gas.

Benzol is used to start the engines, as they do not start well on Blau gas. The small supply of benzol which is carried also serves as reserve fuel and as ballast.

Another very good substitute for Blau gas is commonly available in this country in the oil refinery gas derived from the manufacture of gasoline, which generally can be had of the same approximate specific gravity and heat content as Blau gas.

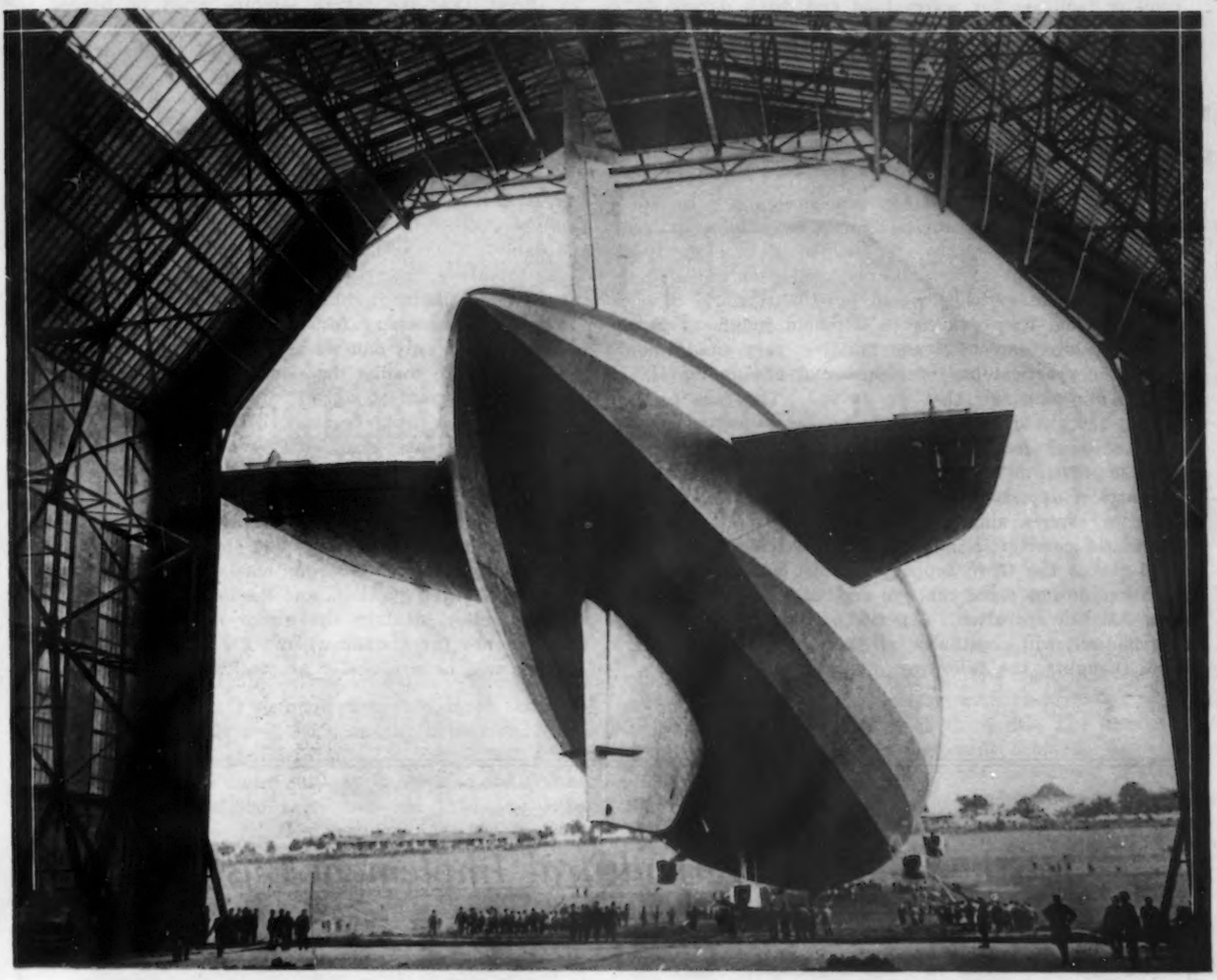
United States Naval Airships ZRS-4 and ZRS-5

CONTRACTS for two dirigibles for the United States Navy have recently been signed with the Goodyear Zeppelin Corporation of Akron, Ohio. The cost will be $5,375,000 for the first and $2,450,000 for the second.

Dirigibles: Their Size and Capacity

Designating Number or Class	Number Built	Volume in Cubic Feet	Length in Feet	Diameter in Feet	Lift: Gross Tons	Lift: Useful Load (a)	Lift: Useful Load (b)	Estimated Ceiling, Feet	Total Brake Horsepower	Speed Full Power, Miles per Hr.	Approximate Endurance, Full Power, Miles	Remarks
GERMAN												
Zeppelin Works:												
LZ-15	5	686,000	466	48.7	20.8	6.9	33.00	5,000	495	45	....	Internal keel, monoplane rudders.
LZ-18	1	950,000	518	54.4	28.8	10.8	37.7	6,000	720	49	....	Do.
LZ-25	19	792,000	518	48.7	24.0	8.5	35.5	6,600	630	44	....	Do.
LZ-26	3	880,000	530	52.4	26.8	9.8	36.7	9,000	630	50	....	Do.
LZ-40	35	1,128,000	535	61.3	33.8	14.7	43.0	10,000	840	53	1,500	Hull girder construction.
LZ-41	35	1,262,000	586	61.3	38.5	16.9	44.0	10,500	960	59	1,600	Lengthened LZ-40 class.
LZ-62	17	1,940,000	649	78.4	58.9	31.9	54.0	14,000	1,440	60	3,100	First Zeppelin to have side cars.
LZ-91	2	1,960,000	645	78.4	59.4	35.8	50.5	15,000	1,220	61	4,100	
LZ-95	7	1,970,000	645	78.4	59.9	38.3	61.5	20,000	1,200	61	4,650	First use of 2 engines driving 1 propeller.
LZ-100	10	1,975,000	645	78.4	59.9	39.4	65.6	21,000	1,450	71	5,000	High-climbing class.
LZ-104	2	2,420,000	743	78.4	73.4	50.9	69.6	18,000	1,200	63	6,200	Long-range class.
LZ-112	3	2,400,000	743	78.4	72.8	43.5	60.0	21,000	2,030	75	4,500	High speed and climbing class.
LZ-120	2	796,000	425	61.3	24.1	11.3	47.0	10,000	960	80	1,700	Bodensee or Nordstern type. Wood girders, longitudinal framing.
Schutte-Lanz:												
SL-2	1	968,000	512	59.7	29.5	10.2	34.9	5,000	840	55	2,900	Streamline shape propellers on cars.
SL-3	3	1,144,000	503	64.8	34.8	13.8	39.4	5,000	840	53	1,300	
SL-6	4	1,240,000	532	64.8	37.8	18.3	48.4	6,000	960	57	1,600	
SL-10	10	1,370,000	572	66	41.7	20.2	48.5	10,000	960	56	2,600	
SL-20	3	1,978,000	650	75.2	60.0	34.7	58.0	16,000	1,200	63	4,300	
BRITISH												
R-9	1	889,000	520	53	25.6	3.8	17.0	1,000	360	45	200	Multiple surface control.
R-23	4	997,000	535	53	28.7	5.7	19.9	3,200	1,000	52	550	External keel, monoplane controls.
R-27	2	990,000	539	53	28.6	8.4	29.4	6,800	1,000	54	1,100	No external keel.
R-31	2	1,550,000	615	65.6	44.3	14.3	32.3	8,000	1,250	65	1,600	Wood girders.
R-33	2	2,000,000	643	78.7	58.0	27.5	48.49	14,400	1,250	62	4,000	Trans-Atlantic type.
R-36	2	2,150,000	672	78.7	62.2	30.9	49.7	15,500	1,400	65	4,250	Lengthened R-33 class.
R-80	1	1,250,000	530	70	36.4	15.3	42.4	12,000	1,000	60	2,600	
R-38	1	2,724,000	695	85.5	83.0	50.0	60.2	21,000	2,100	69–70	5,000	Estimated performance.
UNITED STATES												
ZR-1	1	2,115,174	680	78.6	66.0	28.0	50.0	15,000	1,500	59	4,300	
ZR-2	1	2,724,000	695	85.5	83.0	50.0	60.2	21,000	2,100	69–70	5,000	Ex-British R-38.

Useful load includes (a) fixed load, crew, food, guns and other fixed equipment; and (b) disposable load: fuel, bombs and dischargeable ballast.



Monoplane Elevators and Rudders at Stern of Graf Zeppelin. Note also side car construction for engines

These ships will greatly surpass in size and performance any others built or now building. The magnitude of this advance may be judged by comparing the principal characteristics of the new airships, ZRS-4 and ZRS-5, designed in 1928, and the Navy's sole rigid airship, the U.S.S. Los Angeles, designed in 1922.

It is particularly striking that the new airships will be able to go more than two and a half times as far as the Los Angeles without refueling. Since the function of naval airships is long distance scouting at sea, the great range of the new ships is of the utmost value.

Probably the outstanding novelty will be a complete airplane hangar built within the hull of the airship, capable of housing five scouting airplanes. The airplanes may be raised or lowered on a trapeze swinging through large sliding doors in the bottom of the hangar. Airplanes intended for such use will have special hooks above their wings for attaching to the trapeze.

Principal Characteristics of the Los Angeles and the ZRS-4

	Los Angeles	ZRS-4
Nominal gas volume, cu. ft.	2,470,000	6,500,000
Length overall, ft.	658.3	785
Maximum diameter, ft.	90.7	132.9
Height overall, ft.	104.4	146.5
Gross lift, lb.	153,000	403,000
Useful lift, lb.	60,000	182,000
Number of engines.	5	8
Total horsepower	2,000	4,480
Maximum speed, knots.	63.5	72.8
Range without refueling at 50 knots cruising speed, nautical miles.	3,500	9,180

Externally, the new airships will appear fuller and less slender than the Los Angeles. The air lines of the hull will not be disfigured as in the past by external cars containing the engines. Engines and engineers will be housed within the hull, thus reducing the air resistance and improving the safety. (This is one of the lessons learned from the loss of the Shenandoah, when all who remained within the hull escaped without injury.) Propellers will be supported on brackets from the hull, driven by the engines through transverse shafts and bevel gears. An important and interesting feature is that the propeller shafts can be turned into a vertical position to exert up or down thrust, thus assisting in taking off or landing.

The skeletons of the new airships, like their predecessors, will consist of duralumin longitudinal and transverse girders, with steel wire bracing. Girders will be of a new type, stronger and more efficient than hitherto used. Outside the hull will be covered with the characteristic aluminized fabric, drawn smooth and tight. Buoyant helium gas will be contained in eleven separate cells of gas-tight fabric. The strength of the hull will be sufficient for storm or squall conditions approximately twice as severe as the Los Angeles could successfully encounter.

A notable improvement will be the provision of no less than three longitudinal corridors, and passageways completely around the circumference of each main transverse frame, giving access to all parts of the ship, so that inspection and repairs can be carried out in flight with a facility never before possible.

Nothing is more important than adequate quarters for officers and men, well warmed and ventilated, and ample

cooking facilities for warm food and drink during days and nights of continuous flying. Particular attention has therefore been given to the comfort of the crew. Being naval vessels, they will have no luxurious passenger accommodations; but in habitability for their crews, they will compare favorably with cruisers and destroyers.

Yet Bigger Ships in the Future

TO date, despite the tremendous development recorded and under way, the airship cannot be called a commercial proposition. Had the men responsible for the technical advancement so far accomplished been engaged in any other industry, they would have been world figures today. When they ask us to withhold judgment until, with the ships now built and building, they can demonstrate the practicability of commercial airship travel, is it not eminently fair that we do so? The case for or against the airship is now on the books; ships under way or actually projected will provide the answer to many questions much more conclusively than any speculation on the parts of experts or near experts. A single successful flight, or even a single failure, will not tell the whole fate of the commercial airship. Even the highly successful flight of the Graf Zeppelin against adverse weather conditions is not proof that we are ready for commercial trans-Atlantic operation. A period of future development, long in time, will eventually tell the story. Tempered by these thoughts, the following opinions are advanced:

First, that the future airships must be bigger and better than those of the past or present. The Navy has recognized this trend in specifying a capacity of 6,500,000 cu. ft. for the two new airships about to be built. England has recognized it in specifying 5,000,000 cu. ft. capacity for the two ships she is building. It may seem to the uninitiated that the jumps in the size of airships are being made too quickly and before a justification for the increased size exists. It may be argued that size should not be increased until the smaller units are proved acceptable. Yet the lessons we learn from previous ships lost, from flights of ships now being operated, and from the trans-Atlantic flight of the Graf Zeppelin, all point toward the necessity for greater strength and greater power. Thus only can we assure ourselves that the ship will be able to combat the elements and to force her way through the greatest storms. Increased strength and increased power mean greater lifting capacity, which in turn means greater size.

Secondly, that with greater size will come an increased use of steel in the frame. This trend is seen in the British R-101. Present conventional designs use steel for most fittings, all wiring, and some tubing. With the steel hangars, steel mooring masts, and steel handling devices a settled question, and the imminent incorporation of high alloy steel in the girder construction, the day may be not far distant when rigid airships and airship devices will be practically all-steel structures.

Further Gain in Agricultural Implement Business in Prospect for 1929

FOR several years the business of the farm equipment industry has been steadily improving, in keeping with the general trend toward more satisfactory conditions on the farm.

In some of those years that trend was modified by unfavorable weather or market conditions affecting considerable areas in some sections of the country; yet, on the whole, demand for modern equipment was such that the industry progressed favorably.

This year, satisfactory farm conditions are widespread. East, west, north and south, crops of more than average yield have been harvested. Crop prices have been fairly good. Favorable prices for livestock have been maintained. In general, farmers have a substantial purchasing power which should be reflected in further improvement of business for the farm equipment industry in 1929.

Farmers today are more keenly interested than ever before in labor-saving, cost-reducing farm machinery. Responding to that interest, manufacturers are concentrating more than ever before on the development of such machinery. The up-to-date, handy, efficient tractor, the mechanical corn picker, larger outfits for planting and cultivating corn, the disk tiller for preparing wheat land, and the combine are good examples of that development.

WILLIAM BUTTERWORTH

President, Deere & Co., Moline, Ill., and President, Chamber of Commerce of the United States

In all sections farmers want machinery of greater capacity than the types they have been using—machinery that will enable one man to get more work done and produce crops at lower cost per bushel, bale or ton. This interest, translated into actual purchases, is such that it amounts to a revolution in farming methods. It promises a new day on the farm—an era of more satisfactory farm profits; and a good, substantial growing business for the farm equipment industry.

WILLIAM BUTTERWORTH.

Power Farming Requires More Steel

Farm Equipment Plants, Operating at High Rate Throughout Year, Bought 30 Per Cent More Steel Than in 1927—Sharp Gains in Machine Tool Purchases

OVER 20 sizable American farms are now being operated without horses or mules. The number of farm draft animals decreased more than 3,000,000 between 1920 and 1925, and a further reduction will undoubtedly be shown when later figures are available. Farm acreage under cultivation has also diminished, having shrunk 5,000,000 acres between 1920 and 1928, while agricultural population declined 3,700,000 between 1920 and 1927. Crop yield, however, has gone up nearly 5 per cent and production of animal products 15 per cent, while average productivity per farm worker has risen approximately 15 per cent.

The explanation lies in power farming. The mechanizing of agriculture, according to competent observers, has only begun, and its further development will do far more than legislation to solve the farm problem. Not only will there be wider adoption of gasoline-driven tractors and improved implements, but the time is not far away, according to present indications, when rural districts will be as freely supplied with electricity as urban communities are today. Experiments with electrical power on the farm, conducted by the University of Minnesota during the past four years, show a net increase in farm operating revenue of nearly 100 per cent and a gain in net income of 80 per cent.

Sharp Gain in Steel and Tool Purchases by Implement Plants

New equipment and new methods are enabling one man to plant, cultivate and harvest a larger acreage than ever before. Demands on the farm machinery industry and indirectly on machine tool manufacturers and steel producers have increased sharply. Sales of farm equipment in 1928, according to present estimates, totaled more than $500,000,000, approaching the high record of $536,000,000 in 1920. Steel consumption by farm machinery plants in 1928 is placed at fully 30 per cent above that of 1927, and purchases of machine tools are estimated to have increased 400 per cent.

Manufacturers of power farming equipment are doing a business that is taxing the capacity of their plants. Still heavier bookings are looked for in 1929, barring a general crop failure or a material decline in farmer buying power. At the same time some implement makers are pursuing a cautious policy in arranging their production schedules, realizing that output might be overdone.

Of special interest in the farm equipment trade is the widespread demand for tractors. The trend is toward the general purpose type of tractor, with 10 to 15 hp. at the drawbar and 20 to 35 hp. at the belt. The harvester-thresher combine is also in increasing demand. With this machine the cost of harvesting wheat is reduced 15 to 20c. a bushel. In the past year the combine was used, it is estimated, to harvest 97 per cent of the wheat grown in western Kansas and 40 per cent of the wheat crop of the entire State. A new use for the machine is in harvesting the soy bean in Illinois. Despite the popularity of the combine, manufacturers of old-type threshing machines did a substantial volume of business in 1928.

Plant expansion in the year was chiefly by the larger farm equipment manufacturers and companies making combines and tractors. Two or three new companies began manufacturing combines.

Mergers have not been numerous. The Allis-Chalmers Mfg. Co., Milwaukee, purchased the Monarch Tractor Co. plant at Springfield, Ill. The Vulcan Plow Co., Evansville, Ind., bought the Hayes Pump & Planter Co. plant at Galva, Ill. The J. I. Case Threshing Machine Co., Racine, Wis., purchased the implement lines of the Emerson-Brantingham Co., Rockford, Ill. The Massey-Harris Co., Ltd., Toronto, Ont., bought the J. I. Case Plow Works Co., Racine.

Saturation Point in Tractors Still Remote

Tractors for farm service represent 60 to 70 per cent of the entire output of the country. In 1927 the number of tractors manufactured in the United States was 200,504, of which 184,594 were of the wheel type, according to the Bureau of Census. Output in 1928 is estimated to have been virtually as large, despite the abandonment of operations by the Fordson plant early in the year. A gain of 20 per cent in production is predicted for 1929. Output in 1926 was 182,015 machines, and in 1925, a total of 167,553. Of the 1927 production, 58,274 tractors, including both wheel and crawler types, were exported. Combines to the number of 18,307 were manufactured in 1927, against 11,760 in 1926 and 5131 in 1925.

The tractor is no longer confined to the large farms of the plains States. One prominent manufacturer advertises that all farms of 50 acres or more can support a tractor. It is estimated that 700,000 tractors are now in use in the United States and that output can increase considerably before the saturation point is reached. Even

with saturation, which some competent observers place at 2,000,000 to 2,500,000 tractors, replacement alone, on the basis of an average tractor life of eight years, would call for the production of 250,000 to 312,500 machines annually.

Fully Half of Modern Implements Have Roller Bearings

Tractor manufacturing in its first phase was a failure because of serious faults in the design of the machines, but the experimental stage has passed. Adoption of the tractor is creating a demand for sturdier implements. Those designed to be hauled by horses did not stand up when drawn by tractors. As a result, farm equipment specifications are calling for more forgings and fabricated steel parts. Alloy steel and heat-treated steel are more widely used. Practically one-half of the farm implements now being made are equipped with roller bearings.

Precision in machining, care in heat treating and exhaustive testing are even more necessary in tractor manufacturing than in building automobiles. The tractor is built for much harder service than the motor car. It must be sturdier, and must be built to close limits. Most manufacturers put their tractors through a severe test under varying loads, usually for 4 hr., before shipping them.

Agricultural implement plants promise to take an increasing volume of machine tools and other manufacturing equipment. This expansion in requirements will be not merely a response to the gain in implement production, since existing factory capacity in most cases is regarded as adequate, but it will represent the revision of manufacturing methods in the interests of greater efficiency.

Machine Tool Buying Stimulated by Changes in Implement Design

Continued improvement in the design of machine tools makes it necessary for implement makers to give serious consideration to obsolescence, since it is frequently possible to reduce manufacturing costs to a substantial degree by replacing old equipment with new. Changes in the design of tractors and implements, such as the introduction of roller bearings and stronger materials, and the need for closer tolerances and faster cutting speeds in machining are also creating a larger demand for metal-working equipment.

Speaking of power farm equipment and its efficiency, Renick W. Dunlap, Assistant Secretary of Agriculture, points out that the labor required to harvest an acre of wheat in the great plains of the West has been reduced from 3½ to ¾ man-hours. Increased mechanization in the corn belt, he thinks, will result in expansion of the farm unit, although naturally the change in that direction will come more slowly in an older agricultural area like Ohio than in Montana or western Kansas. The farmer of outstanding business ability, he asserted, realizes that successful management of the larger farm of the future offers as wide a scope for resourcefulness as do many of the enterprises of the city.

Advent of Power Farming Likened to Industrial Revolution

Mr. Dunlap declared that the farmer of the future will enjoy a higher standard of living. More efficient, larger-unit farming will permit it, and a progressive rural citizenry will demand it, he said.

"Already electricity, for example, is reducing the drudgery of the farmer's wife, and making the household more livable," he pointed out. "Our engineers tell us that we have only begun to take advantage of electricity on the farm."

Rural electrification for both light and power is being given intense study by electrical utility companies, not to mention the Society for Electrical Development.

Steel Merchant Improves His Position

Better Merchandising Methods Through "Selling" the Idea of Service a Factor in Solving Warehouse Problems—Motor Truck Delivery a Help

STEEL jobbers look with considerable satisfaction to the volume of business they did in 1928, which showed a good gain over the previous year, and they take a hopeful view of the future of the steel warehouse industry. Jobbers' sales gained last year, but little of the increase in their business could be attributed to inability on the part of the mills to make early deliveries. In spite of the good volume of business, mills were in position to make satisfactory deliveries the greater part of the year, or up to September or October, so that only for a few weeks late in the year was a slowing down of mill shipments a factor in stimulating warehouse sales. Makers of steel products are showing a disposition to give jobbers an opportunity to do a profitable business and some jobbers are increasing their sales by the rendering of service and by improved merchandising methods.

Mills did not make many changes last year in methods of quoting prices and in the adoption of quantity differentials that would render assistance to the steel merchant. The latest development in the method of quoting prices of interest to the jobbing trade is the adoption by the mills of the "carload price to the trade" as the price on wire products, this taking the place of a price for car lots to jobbers as previously quoted. In naming as the market the carload price for consumers and retailers, the mills evidently had in mind the giving of increased protection to the jobbers through the submersion of the prices the jobbers pay for stocks, heretofore the base prices. Under the new plan the jobber will sell car lots for mill shipment at the regularly quoted prices and mills will maintain the same price when selling car lots to the retail trade. Large jobbers are being allowed a 10c. per 100-lb. discount, which means the same in commission on sales as under the old plan of jobbers selling car lots at 10c. per 100 lb. above the regular quoted prices. Small jobbers are allowed only 5c. per 100-lb. discount.

Hope to Effect Market Stabilization

The mills hope by the new plan to effect a better stabilization of the market and to avoid the pressure of jobbers for special prices. Formerly, certain buyers were able at times to buy under the regular market price and infrequently gave away some of their price advantage. This tended to create a highly competitive secondary market, which made it hard for manufacturers to hold up prices, because one mill could not let its distributers remain long at a price disadvantage with the distributer of another mill. Jobbers, having large stocks bought prior to a price advance, have on occasions made sales at prices as low as or lower than mills were openly quoting. Under the new plan, producers of wire products appear to be attempting to retain for themselves for direct service

the very large consumers and are trying to divert smaller business to the jobbers. It is too early to determine how successful the plan will be in affording protection to the jobber.

The substitution by sheet makers during the latter part of the year of a one-half of 1 per cent discount for payment in 10 days in place of the long established 2 per cent discount failed to meet approval from the jobbing trade, as it tended to cut their profits. Jobbers generally had been taking advantage of the 2 per cent discount and allowed the same terms to their customers. However, most jobbers' customers are small buyers and a large share of them did not pay their bills in time to get the 2 per cent discount from the jobbers. Not having to pass the 2 per cent discount along to their customers resulted in some gain for the jobbers, which has been largely eliminated by the reduction in the mill discount. Those of the jobbers' customers who formerly paid within 10 days are now more inclined to allow their accounts to run longer, thus increasing the bills receivable on the jobbers' books.

The lower mill discount works to a further disadvantage to many jobbers who are still allowing 2 per cent discount to their customers. While jobbers who confine their business almost wholly to mill products have cut their discount on sheets to one-half of 1 per cent to conform to mill practice, others are still allowing 2 per cent discount for shipment from stock, having reduced their discount only for car lots. Their reason for retaining the 2 per cent discount is that these jobbers handle other products, including formed sheet metal products used in the building field, on which they allow 2 per cent, and they do not deem it worth while to make up separate invoices with different discounts. Hardware jobbers also still allow 2 per cent discount on sheets because they sell their other merchandise on that discount basis.

Varying Cash Discounts Cause Confusion

SOME confusion has arisen in the jobbing trade by the retention of old discount on some products. Coated tin mill products, that is tin plate and terne plate, remain on the 2 per cent discount basis while mills have adopted one-half of 1 per cent for tin mill black plate, also a tin mill product. Long ternes rolled on sheet mills now carry one-half of 1 per cent discount, but box or short ternes, a tin mill product, remain on the 2 per cent discount basis.

The present plan of selling bolts and nuts with a common manufacturers' discount and a close dividing line between one class composed of legitimate jobbers and large consumers such as the automobile and agricultural implement manufacturers and railroads that buy from the makers and are allowed the manufacturers' discount, and in the other class retailers both large and small who pay the jobbers' resale price, has stood the test of operation since it was placed in effect early in 1927 and has proved highly satisfactory to both manufacturers and jobbers.

Committees meet occasionally in the 34 jobbing centers to go over the list of preferred buyers and add to or remove names from the lists should a change in the status of a buyer warrant the addition or elimination of his name from the list. Relations between the bolt and nut manufacturer and jobber are amicable, and the plan has worked so satisfactorily that a movement is on foot among some of the jobbers' committees to try to induce manufacturers of some other products sold through the hardware trade to adopt a similar plan to protect the jobber by drawing a line dividing the customers to whom the manufacturer is to make direct sales and the class of customers who are to buy from jobbers or at least pay jobbers' resale prices.

Jobbers were benefited last year by the adoption by the mills of lump sum quantity differentials on hot-rolled steel bars and small shapes in lots of less than 4000 lb. Some of the mills put these extras in effect in December, 1927, but they were not generally adopted until last January. Under these extras, a customer finds it cheaper to buy less than 1000 to 1500 lb. from a warehouse than from a mill. These differentials appear to have been fairly well adhered to by the mills. While they divert a certain amount of business to the jobbers, some objection has come from the latter because they are penalized on small-lot mill orders.

Service has become the keynote of the successful steel merchant of today, according to some of the more progressive jobbers, who are doing less complaining than formerly about the competition of the mills for small orders and are devoting more attention to the problem of constructive selling of the steel warehouse idea; that is, the service that the jobber can render to the customer which cannot be secured from the mill. Jobbers in this campaign of education are making it clear that they are not trying to compete with the mills, but that they can render a distinct service that is not obtainable from the mill. By following this plan they are attempting to solve their own merchandising problems without looking to the mills for help.

Jobbers who claim that their industry has done little in the past along the line of constructive selling of the idea that the warehouse occupies a distinct field point out that there is a sharp line of demarcation between warehouse and mill business and that, if this line is properly drawn, the jobber and mill will no longer be competing with each other. They class the mill as a prime source of supply and the warehouse as a secondary source of supply. The first question that comes to the mind of a purchasing agent when he is given a requisition for steel is whether the order should go to a mill or warehouse. There is no evidence of any marked change in the policy of mills in regard to taking small orders, but, under the plan of aggressive salesmanship, steel merchants are attempting to convince buyers that it would be more economical for them to place with the warehouses many of the small orders that now go to the mills.

Merchant Today Rendering More Service

THE steel merchant of today is rendering more service than a few years ago, and it is the aim of the campaign of education to give consumers a better acquaintance with this service than many have at present. The demands on the steel warehouses have changed and are more exacting than in the past, and up to date warehouses are meeting the new conditions and in this respect are performing a service that can hardly be expected of the mills.

Warehouse service is no longer limited to more prompt deliveries than the mills can make. The trade has forced warehouses to put in cutting equipment to meet tolerance requirements that are more exacting, and it has become one of the selling arguments of jobbers that they will supply steel cut to closer limits than that supplied by the mills. Customers now insist that bars and angles be cut to close limits, that structural sections be cut to fit, that plates be sheared or burned accurately, that bars be straight and that plates and sheets be flat.

Improved methods of some warehouses include the cutting of channels and T's with dies. Merchants are asked to supply flat material cut into irregular shapes, disks of all sizes and steel in other forms that formerly was not available at warehouses. These requirements of the customer are forcing jobbers to do considerable work on material that was formerly done by the buyer in his own plant. To meet the additional requirements of the trade, the modern warehouse is provided with a more and better cutting equipment than a few years ago.

Some of the jobbers are trying to convince buyers that mill rolling schedules often do not permit the shipment

of small lots of steel as soon as expected, causing tie-up of work in consumers' plants and consequently a loss that more than offsets the saving in the cost of material bought from mill instead of warehouse. Some buyers, to save extra cost of warehouse shipments, place a mill order for a larger quantity than they actually need, expecting to find some use for the remainder later. Jobbers contend that this is bad practice and that the buyer, after keeping the surplus material in stock for some time and finding no use for it, often attempts to dispose of it for what he can get. Steel merchants are also making some effort to convince mills that, as they are not equipped to handle small-lot business, they are taking many small-lot orders at a loss and that such business rightfully belongs to the jobbers. Jobbers themselves realize that to perform the service demanded by most customers they must always have complete stocks and in their own buying must anticipate the needs of their customers.

Motor Truck Delivery Aids Warehouse

Changes in means of transportation reflected to the advantage of steel warehouses the past year. With the more general establishment of motor truck transportation, with central shipping stations and a network of routes reaching practically all consuming points, warehouses in some districts used the truck service last year much more than heretofore in shipping steel to points outside of their city deliveries. The main advantage they find in trucks is that they make quicker deliveries than the railroads and consequently the warehouse can render better service than it formerly could by rail shipments. This gives the warehouse an additional advantage over mill deliveries made by rail. Transportation rates by truck are usually the same as by rail, but there is a saving for the buyer in that the steel is delivered at his door, thus eliminating trucking from a railroad depot. A jobber receiving an order by noon delivers the steel to a motor truck station in the afternoon and it is delivered to the customer the next forenoon. Some jobbers are finding it practical to ship steel 70 miles by truck. For large lots, the means of transportation depends on the rate and destination. When the quantity is much larger than the usual warehouse order or close to a car lot, it is usually cheaper to ship by rail at the car lot rate.

Shipbuilding Industry May Be Revived

Loan and Mail-Carrying Contract Provisions of Jones-White Merchant Marine Act Expected to Stimulate Construction of Many New Vessels

A REVIVAL of American shipbuilding, which has been depressed since the war, may result from the loan provisions of the Jones-White Merchant Marine Act, passed by Congress last spring. The Postoffice Department has awarded, under the terms of this act, mail-carrying contracts which require the building of at least 39 new ships. So far, only three vessels have been awarded, but 1929 should bring a shipbuilding activity greater than has been known in this country since the United States Shipping Board completed its war time agitation for "Ships and more ships."

Shipbuilding interests take the view that no great stimulation of shipbuilding will occur until Congress has amended the Jones-White act to include cargo ships as well as passenger and mail-carrying vessels.

Three ships are now being built under the Jones-White act as follows:

International Mercantile Marine, a sister ship of the Virginia, recently completed; 34,000 tons displacement; under construction at yards of Newport News Shipbuilding & Dry Dock Co., Newport News, Va.

Grace Line, one ship, recently awarded to New York Shipbuilding Corporation, Camden, N. J.

American-South African Line, one ship, recently awarded to Sun Shipbuilding Co., Chester, Pa.

Mail Contracts Which Require Building of New Ships

The Postoffice Department has awarded mail-carrying contracts to the companies named below requiring the construction of new ships as stated:

Export Steamship Corporation, New York to Mediterranean and Black Sea ports; four vessels of Class 5; one such vessel within three years from award of contract and one additional vessel each year until four vessels have been placed in operation.

American-South African Line, New York to Beira, Portuguese East Africa; one new vessel of Class 5 within two years of award of contract and one additional new vessel of Class 5 after the fifth year.

Grace Steamship Co., New York to Valparaiso; one additional new vessel of Class 4 within one year from award of contract and one additional new vessel of Class 4 within three years after award of contract.

American Scantic Line, New York to Copenhagen; eight vessels of Class 6, of which two are to be completed within 15 months from award of contract, and one additional such vessel within the succeeding 15 months and one each additional 18 months thereafter.

Atlantic & Caribbean Steam Navigation Co., New York to Maracaibo; after completion of third year of contract, one additional vessel of Class 5.

American West African Line, New York to West African ports; three vessels of Class 5, of which one vessel shall be delivered within the fourth year from the award of contract and two such vessels during the remainder of the contract.

New York & Cuba Mail Steamship Co., New York to Havana; two new vessels of Class 3 within three years from award of contract.

New York & Cuba Mail Steamship Co., New York to Progreso, Mexico; one vessel of Class 5 within three years from award of contract.

Oceanic Steamship Co., San Francisco to Sydney; two new vessels of Class 3, one to be delivered within three years from award of contract and another such vessel within four years.

Dollar Steamship Line, San Francisco to Colombo, Ceylon; new vessels of Class 3, one within three years and one each succeeding two years.

States Steamship Co., Portland to Manila; two vessels of Class 5; one during fourth year of contract and one during the remainder of the term of contract.

American Line Steamship Corporation, New York to Balboa, Canal Zone; three vessels of Class 3 as soon as possible, but not more than three years from beginning of service of contract.

South Atlantic Steamship Co. of Delaware, from Savannah via Brest to Liverpool and from Savannah via Plymouth to Bremen; three vessels of Class 6, one during the fourth year, one during the seventh year and one during the ninth year.

Pacific Argentine Brazil Line, San Francisco and Los Angeles via Bahia Blanca and Buenos Aires; sufficient additional vessels of Class 6 to provide a frequency of 18 trips per annum not later than third year of contract.

The Postoffice Department has divided ships to be built into seven classifications, the deadweight tonnage being as follows: Class 7, 2500; Class 6, 4000; Class 5, 8000; Class 4, 10,000; Class 3, 12,000; Class 2, 16,000; Class 1, 20,000. It is further provided that the classification of ships may be based upon speed, regardless of tonnage, if in the opinion of the Postoffice Department speed is in the interest of postal service.

Several New Ships Now Under Consideration and Awards May Come Soon

Ships on which bids have been asked or will be asked soon include four for the Export Steamship Corporation,

two for the New York & Cuba Mail Steamship Co. (Ward Line), two for the Matson Line, one or two for the Dollar Line, three or four for the Admiral Line and two for the Eastern Steamship Lines, Inc. The Columbian Steamship Co. is considering the building of three ships, but decision awaits action on a pending mail contract.

In addition to new ships whose construction will be required under the Postoffice Department awards, it is known that negotiations are under way for larger ships, details of which have not as yet become public. One company is expected to ask for bids within the next six months for the construction of two 20,000-ton ships of 22 knots, costing about $9,000,000 each, while another prominent American operator is expected to order three ships of this same type within a short time for establishing a service around the world.

The Postoffice Department contracts which definitely call for the construction of 39 ships with a minimum deadweight tonnage of 261,700 will require 125,000 or more tons of steel, about two-thirds plates, one-quarter in shapes and the remainder in bars.

Not only does the prospective revival of shipbuilding offer promise to the steel industry, but also to machine tools and other lines which radiate about the shipbuilding industry. H. G. Smith, vice-president Bethlehem Shipbuilding Corporation, recently stated that 146 industries, covering every State in the country, are involved in the building of a ship.

Chief Obstacle to Success of Plan is High Cost of American Production

Some of the mail contracts call for the starting of construction at once on certain of the ships, with a longer time for others. The bulk of the construction, however, is to be completed in five years. Bids have already been asked by some operators, but in at least one instance they were rejected as being too high. This is a point which is viewed in some quarters as an obstacle to the wholly successful operation of the Jones-White act. The American cost is held to be so much greater than the foreign cost that it will be difficult for American operators to compete on such a basis, and under the law the ships and the materials going into them must be of American origin.

The law sets up a revolving fund of $250,000,000, in charge of the Shipping Board. Operators may borrow from the fund up to 75 per cent of the value of the ships, and to encourage shipbuilding further the rate of interest is that which the Government itself pays, about 3½ per cent. The act also provides for the payment of from $1.50 to $12 per mile for the carrying of ocean mail on ships with speeds ranging from a minimum of 10 knots to a maximum of 24 knots, with a provision for prorata higher pay for vessels with speed in excess of 24 knots.

The granting of loans up to the present has been limited, but numerous applications have been made to the Shipping Board. The board will have to determine whether it is justified in making the loan desired. Commissioner Jefferson Myers told THE IRON AGE that he thought there would be no difficulty on this point, and expressed the view that the relatively high cost of construction in American yards would be worked out satisfactorily. The cost factor, however, is an important element because the Shipping Board must determine whether it exceeds 75 per cent of the value of the ships proposed to be built.

Government Officials Take Hopeful View of Results of Jones-White Act

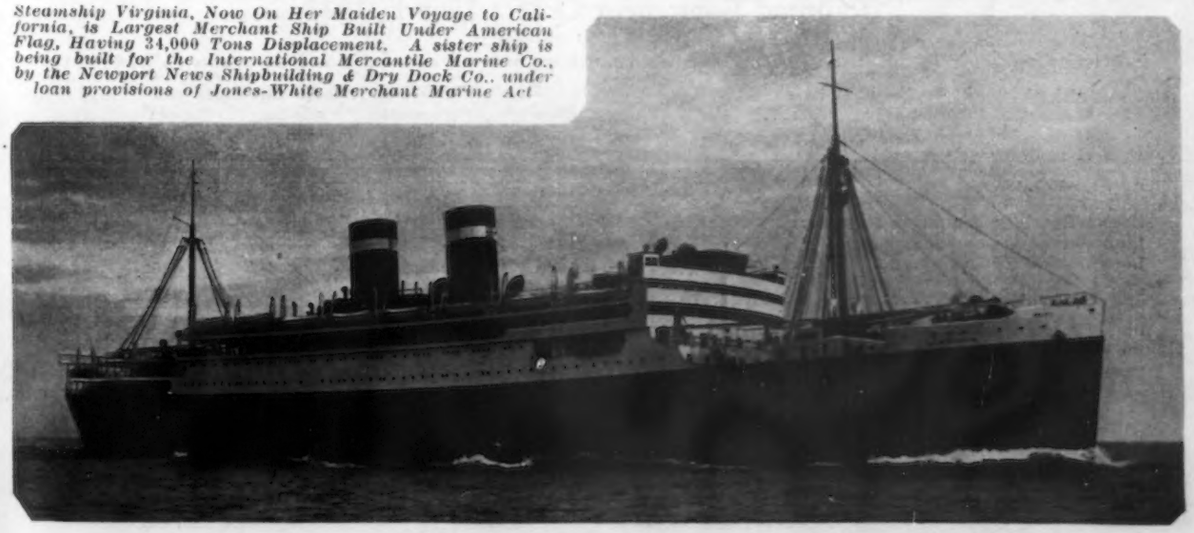
Commissioner Myers declared that every effort will be made to encourage shipbuilding in the United States and the restoration of an adequate, privately-owned merchant marine fleet. The great need, he said, is for more speed, a fact which the Jones-White act recognized, not only by the pay provisions for ocean mail carrying by ships, but by authorizing the Postoffice Department to allow additional compensation for air mail from ship to shore and from shore to ship. This provision was inserted in the bill so that every modern development for expediting mails may be utilized.

There has been discussion of the building of six American liners to provide four-day service between American and British and French ports. The ships, designed as airplane carriers, would be by far the fastest on the ocean.

Postmaster General Harry S. New, members of the United States Shipping Board, many shipbuilders and others have strongly praised the Jones-White legislation. Enacted only last spring, it has not been in operation long enough to say definitely how much it will accomplish, but already some progress toward shipbuilding revival has begun.

"Our projects for the future have been given new vigor and momentum by the passage of the Jones-White act," said Chairman T. V. O'Connor of the Shipping Board. "The mail-pay provisions of the act and the liberal loans authorized for ship construction promise not only to hasten the transfer of the remaining Shipping Board vessels to private American ownership, but also promise to stabilize and contribute to the success of the lines already established."

Steamship Virginia, Now On Her Maiden Voyage to California, is Largest Merchant Ship Built Under American Flag, Having 34,000 Tons Displacement. A sister ship is being built for the International Mercantile Marine Co., by the Newport News Shipbuilding & Dry Dock Co., under loan provisions of Jones-White Merchant Marine Act



Railroad Equipment Buying Declines

Purchases of Cars and Locomotives in 1928 Smallest Since the War Excepting 1919 and 1921 —Capital Expenditures of Roads Down 16 Per Cent

RAILROAD purchases of cars and locomotives for domestic service in 1928 were the smallest in any year since the war excepting 1919 and 1921. Cars ordered totaled 51,200 and locomotives 503, compared with 72,006 and 734, respectively, in 1927.

Capital expenditures of the railroads for new equipment and additions and betterments to property used in connection with transportation were $650,000,000, nearly 16 per cent below the $771,552,000 expended in 1927, which in turn was 15 per cent below the outlay in 1926.

The amount devoted to new equipment was $215,000,000 compared with $288,700,000 in 1927, a decrease of $73,700,000, or 25.5 per cent. Roadway and structures expenditures totaled $435,000,000 compared with $483,852,000 in 1927, a reduction of $48,852,000, or 10.1 per cent. These figures are furnished by R. H. Aishton, president American Railway Association.

Railroads put down a total of 1341.55 miles of track during 1928, of which 1025.22 was first track, 270.86 miles, second track, 25.33 miles, third track, and 20.14 miles, fourth or more. A total of 722.87 miles of first and second track was laid in Canada, and 58.01 miles in Mexico.

The American Railway Association reports that 57,582 freight cars and 1333 locomotives were installed in service by Class I railroads during 1928 compared with 75,386 freight cars and 1955 locomotives in 1927.

Car Supply Has Declined Continuously

INSTEAD of the railroads increasing their supply of cars and locomotives the reverse trend is evident. This situation is due to increased loading and tractive capacity, quicker releases, greater speed and longer distances of movement, along with other factors such as keeping equipment in better condition. Developments have been pointed to by the Car Service Division, American Railway Association, as justifying its statement in 1927 that in its judgment business of the country could be handled with a total ownership of 100,000 less cars than the total railroad ownership then obtaining, provided (1) that shippers and receivers continued to release cars as promptly as they had been doing and (2) that they should maintain or increase the average load per car.

The Car Service Division also takes the position that some railroads own too many cars for their own good. There are those who believe that the railroads should maintain merely a replacement program, supplying larger cars to take the place of the smaller and less efficient units. M. J. Gormley, chairman of the Car Service Division, commenting recently on the division's statement, said that he takes the view now that the answer would be to increase the number of cars that could be dispensed with rather than to decrease the figure of 100,000.

Taking the six-year period of 1923-1928, as of Oct. 1, compilations of the Car Service Division show a continual decrease in the freight car ownership of Class I railroads since 1923. In the latter year the total was 2,367,467, while in 1928 it was 2,389,501, a decrease of 22,034, but the aggregate capacity increased from 99,809,766 tons to 105,178,404 tons, a gain of 5,368,638 tons, while the average capacity per car increased from 43.36 to 45.80 tons. The Car Service Division figures show that during this six-year period the smalest maximum surplus of cars

Railroad Equipment Orders Low in 1928

Statistics compiled by Railway Age on railroad equipment ordered and built in 1928 *are as follows:*

Equipment Ordered

Freight cars for domestic service	51,200
Freight cars for use in Canada	8,901
Freight cars for export	2,530
Total	62,631
Locomotives for domestic service	503
Locomotives for use in Canada	98
Locomotives for export	27
Total	628
Passenger cars for domestic service	1,930
Passenger cars for use in Canada	334
Passenger cars for export	29
Total	2,293

Equipment Built for Service in the United States

Freight cars	46,060
Locomotives	590
Passenger cars	1,356

Orders for Freight Cars Since 1915

Year	Domestic	Canadian	Export	Total
1915	109,792	.....	18,222	128,014
1916	170,054	.....	35,314	205,368
1917	79,367	.....	53,191	132,558
1918	114,113	9,657	53,547	177,317
1919	22,062	3,837	3,994	29,893
1920	84,207	12,406	9,056	105,669
1921	23,346	30	4,982	28,358
1922	180,154	746	1,072	181,972
1923	94,471	8,685	396	105,552
1924	143,728	1,867	4,017	149,612
1925	92,816	642	2,138	95,596
1926	67,029	1,495	1,971	70,495
1927	72,006	2,133	646	74,785
1928	51,200	8,901	2,530	62,631

Prior to 1918, Canadian orders included in domestic.

1928 Gave More and Better Metals and Alloys, Machines and Machine Parts

Everywhere the demand is for intensive production of materials of finer quality, yet at continually decreasing costs.

Cooperation has brought unusual benefits.

Group researches, technical and trade associations, joint publicity, have perfected the standard materials, even at reduced costs and in larger volumes, developed and marketed new ones, and assisted in stabilizing business groping since the war. . . .

Secrecy and lack of "industry mindedness" is hampering proper developments where it exists. . . .

Group action is necessary to finance and man the precise and intensive researches necessary for perfection of specialties.

—*Burgess.*

Perfection of details of blast furnace equipment and operation, and elimination of isolated plants, keeps tonnage of pig iron rising and costs dropping.

—*Willcox.*

Larger tonnages of superior iron castings in mechanized foundries is the result of intelligent cupola operation and production control.

—*Moldenke.*

Steel castings easily made superior to expectations of customers, and even to the demands of severest service.

—*Hall.*

Open-hearth superintendents' round table discussions and cooperative researches will bring general improvement in steel-making technique.

—*Lindemuth.*

The question, "Will this tool do the work?" is being replaced by the question, "Which of these machines will do the most work at the lowest cost?"

—*Scott.*

Drop forgings are made to closer limits in size, draft, and physical properties, but industry suffers from disorganization and overcapacity.

—*Williams.*

Isolated improvements in alloys, dies and machines gained at great cost because die-casting industry is too secretive.

—*Tour.*

General activity and prosperity in non-ferrous metals result of discriminating placement of each where it is best fitted to serve.

—*Corse.*

Steel Owes Much to Research

Notable Progress in Alloy Steels in the Past Decade—Several New Research Tools Developed—Malleable and Cast Iron Made Over

BY DR. GEORGE K. BURGESS

Dr. Burgess is director Bureau of Standards

ONE cannot but be impressed by the strides the steel industry has taken since 1918, in volume and diversity of production, in the increasing size and speed of manufacturing units, in the reduction of man power and its replacement by improved mechanical and electrical operating devices; in the more and more exacting demand for materials to withstand greater pressures, higher temperatures, wear resistance, dimensional changes, and corrosion; and in the development and installation of more refined scientific methods of control throughout all processes of manufacture — all of which advances imply and require for their accomplishment, the coordinated efforts of scientific men, engineers and executives.

The work of the scientist goes for naught if it is not applied by the engineer, and neither can contribute if the executive does not approve and find the money. They all are studying, experimenting and engaging in problems of research for the progress of the industry.

When a company decides to embark on a production program of casting ingots weighing 450,000 lb. each, can anyone say who has the greater burden, the chemist, the metallurgical engineer, or the board of directors? Eliminate any one of them and the venture is a failure. Until recent years, the chemist was the only scientific man tolerated about the works, and then the metallographist with his microscope was taken on, followed by the physicist first with his pyrometer and then with his X-ray outfits, and the end is not yet.

Advances Are Linked with Research

IF you ask a dozen steel men what is the greatest advance in the industry within the past ten years, you will probably get at least ten different answers. That you can get ten and not one answer is evidence of the diversity of advance and of the great progress made in many lines. What are some of these replies and how are they linked with research?

We are living in an associative age, an epoch of publicity, a period of easy, quick and cheap transportation—this last, thanks to the steel industry—and men engaged in extending our horizon of knowledge relating to steel meet readily in local and national groups and tell each other what they are doing.

Witness the American Society for Steel Treating, which was next to nothing in 1918 and now has chapters all over the land with some 4000 members, publishing a journal crowded with valuable papers, and holding a great annual convention and exhibition which together bring to a focus the results of investigation and invention for the benefit of all concerned. The last two or three years has seen the inauguration of "metal week" when representatives of four or five national societies interested in metal products meet to give and take knowledge fresh from the laboratory and plant.

Various Advances Briefly Catalogued

DURING the ten years, just past, our knowledge of alloy steels, their manufacture, mechanical and thermal treatment, their properties and suitability for specific uses, has grown by leaps and bounds.

The literature of the past ten years is full of accounts of investigations relating to the alloying effects of chromium, nickel, molybdenum, manganese, silicon, vanadium and other elements added to iron.

In recent years the requirements of high-speed machinery, of metals to withstand high temperatures simultaneously with high pressure without distortion, as well well as resisting the erosive action of steam, ammonia and other hot fluids in large volume, have stimulated the investigative genius of many workers. These demands are growing more and more exacting.

In the mechanical operations of mass production of repetitive parts, the requirements for accurate gaging and exact performance by machines have greatly stimulated the machine tool industry and the production of precision gages, in the development of which inventive genius and capacity for research have been pushed to the utmost.

Other notable advances which are bound to be developed further are illustrated by the recent success in the continuous rolling of strip steel from liquid to finished product, setting a new record in speed and continuity; the introduction of centrifugal casting of pipe on a large scale; the development of the high frequency induction furnace from a laboratory appliance to a production unit in the brass industry, an improvement from which the steel industry will eventually profit, after much preliminary experimentation.

Already we have seen the successful production of steel from the ores and further progress is certain to come. There is today keen competition between electric furnace and open-hearth practice for the production of "quality" steels, and the next decade may witness the final outcome of this competition, in which research will play a crucial rôle.

The production of more efficient tool steels has been progressing rapidly and there are appearing new, superior, cutting materials such as tungsten carbide. We may expect further progress here as also in the very recent field of nitride case-hardened steels.

Many are the tools of research which have been developed in these recent years and carried from the laboratory into the works. Ten years ago pyrometric con-

trol was just being introduced while today it is more frequently an indispensable adjunct. Yesterday we were content with a cursory microscopic examination while today for certain grades of steel a rigid high-power metallographic examination is required; the acid etch and other techniques have been developed; and X-ray examination is becoming current for certain products; others now require a magnetic analysis, and the latest application of physical methods is a machine that will mark with certainty a "transverse fissure" in a steel rail in the track from a moving car.

Returning to some of the advances in manufacturing, we see the tendency to replace heavy, complicated castings by lighter, cheaper and stronger welded units of steel using an atomic hydrogen method, a product of "pure" research. Welding is rapidly displacing riveting for many types of structure, following a long series of investigations not yet finished.

Corrosion is being eliminated by the newly developed art of chromium plating and by the substitution of stainless steels. The properties of cast irons and of malleable, thanks to a long series of investigations, have been so greatly improved as to make them into new classes as compared with their predecessors of ten years ago. A brilliant series of investigations on fatigue and corrosion-fatigue of metals have greatly clarified our ideas on their endurance and life under severe service conditions.

One of the great problems, the attack on which has only been begun, is the utilization of the heat now wasted in steel manufacture. Here is a great opportunity. And there are many such opportunities, some greater and some lesser, for our scientific men, engineers and executives to wrestle with during the ten years to come.

Group Method of Study Developed

AN interesting development in research has been the use more and more of the group method of attack; small competitive plants combining to pool their resources for research; committees, such as that relating to the effect of sulphur and phosphorus on the properties of steel, have been cooperating successfully and publishing valuable findings.

New laboratories have sprung up or older ones expanded, industrial, governmental, and institutional. With the consolidation of small plants under one directorate there is a tenlency to establish central research laboratories. The United States Steel Corporation is just starting such a research group to work on problems fundamental to the industry and other large corporations are planning to do the same. The electrical and certain other industries have followed this practice for many years.

Nothing will be more beneficial to the steel industry and the public economy than this recognition of the high place of research. There are also many scientific men not attached to industrial units who carry on their work in advancing knowledge for the love of it. Industry will be wise if it encourages these independent workers without trying to tempt them to join the industry.

More Intricate Stampings Absorbed by Expanding Market

DURING the year 1928 there has been a steady improvement in the quality of the strip and sheet metal available for making stamped parts. This movement is merely the continuation of that started several years ago when automobile body makers first demanded metal which would stand excessive punishment. It will be remembered that progress in this respect was slow at first, but the quality and uniformity now obtainable in all widths, sizes and finishes (together with a corresponding increased knowledge about the cold working of metal) is such that stampings are now produced regularly which but a short time ago would have been considered impossible or at least impracticable. Continued study has also been given to the design of dies, clearances, unit pressures, and distribution of the deformation to avoid local overstrain in the sheet. Such investigations have resulted in better presses and better accessories such as air cushions. The total result is that stampings are now made with fewer operations, yet without excessive straining or thinning of the metal and with less spoilage, and this applies not only to work of no great difficulty, but also to that class formerly regarded as impractical because of the excessive handling or the heat treatment which would then have been required.

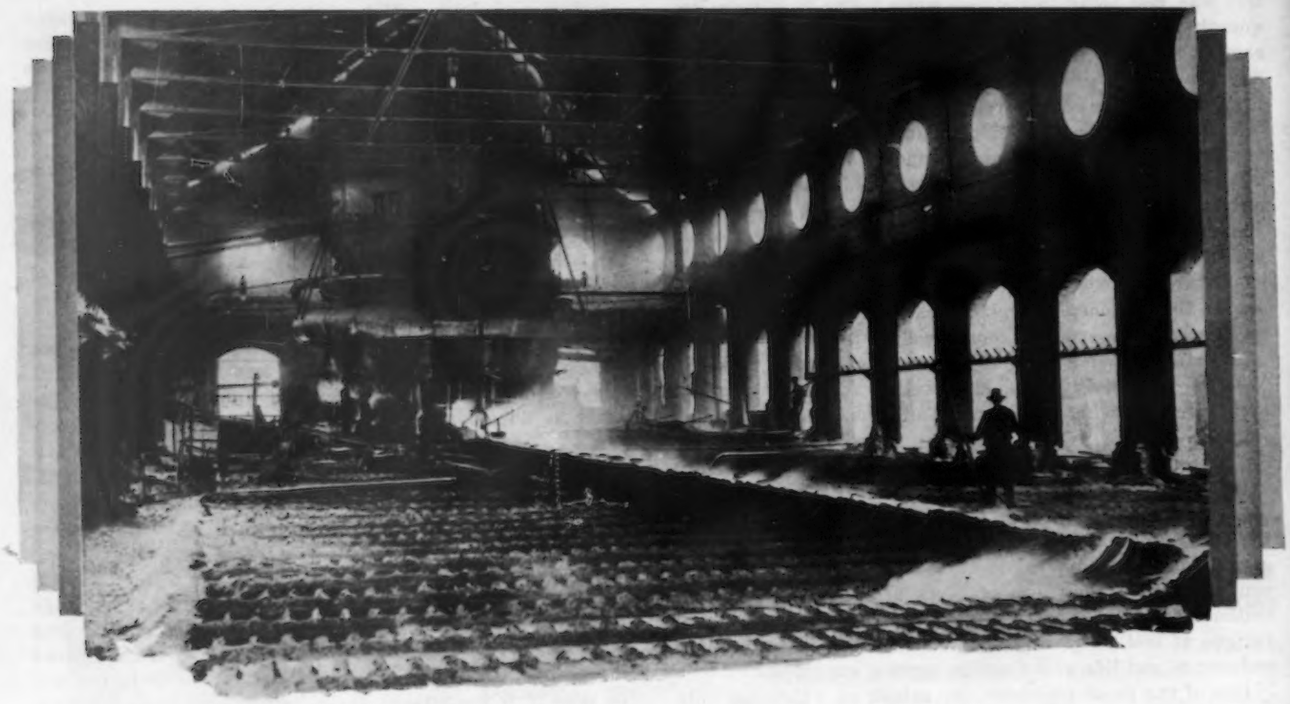
As better steel, better presses and dies, improved toolroom equipment and general facilities are now available, the production costs are naturally declining, and the capabilities of the process are expanding. All these factors have made for an increased use of stampings and the expansion promises to continue. However, one must not overlook the "volume factor," so important when considering the utility of pressed metal parts. Many articles now made in other ways might be stamped to advantage were the quantity required sufficient to warrant the cost of the necessary tools. As mass production increases, therefore, the use of stampings in American industry is bound to increase.

Pressed sheet metal parts have proved highly successful in automobile construction, and this will continue to be one of the large outlets. The automotive and stamping industries have grown hand in hand. The size of the individual pieces varies from a tiny nut socket to a sedan side. Even larger pieces are pressed from two or three sheets after they have been flash welded together. In time the aeroplane will doubtless contain as large a percentage of stampings as the automobile does today. Scrap from these operations furnishes considerable tonnage of low-cost but high grade metal for toys, kitchen utensils and small specialties.

Radio manufacture consumes a large and increasing quantity of pressed sheet metal. Other electric equipment, however, furnishes a market which now is apparently saturated. Increases in this business will occur only as the demand for electric appliances grows.

Much has been said about the economy of replacing castings with welded sheet metal products. On inquiry it is found that the actual trend is slight. One change is apparent, though. The first thought in a designer's mind used to be "Make a casting." Now it is: "Shall we cast or stamp it?" Sometimes a wrong decision is made; then a shift one way or the other occurs. But there is apparently no noticeable drift. Welding, of course, has assisted greatly in the introduction of sheet steel furniture and cabinet work of all sorts, and thus has increased the consumption of thin-walled tubing and sheet metal. But these materials are not within the classification of "stampings." The campaign for welded steel construction, therefore, will probably mean more to rolled plate and shapes than it will to stamped sheet metal.

The seventh annual report of the British Cast Iron Research Associatioi notes that investigations are being continued on corrosion-resisting cast irons, heat-resisting irons, malleable cast iron, the influence of manganese, a series of alloy irons, molding sands, cupolas, and physical and chemical tests.



Trend in Blast Furnace Field

Increasingly Larger Stacks, with the Degree of Control of Chemical and Heat Reactions Already Achieved, Point to Lower Cost Pig Iron

BY F. H. WILLCOX

COMPETITION is not confined to the sales price of pig iron, b ut manifests itself quite as much in material expressions of mental perception or personal ambition and ability. The blast furnace profession and the business of operation, management, design of plants, being susceptible to individualism quite equally as in occupations not so thoroughly tied down to inanimate objects, are always an interesting field of activity, either from the side line or for the participant.

Having to deal with materials of inherent perversity, with operations that too often are but a succession of emergencies, those whose fortunes are cast with the blast furnace, while possessing good balance and intelligence for the affairs of business, must and do develop a resourcefulness and pertinacity for the overcoming of tangible and intangible obstacles, an ability and intuition to look behind the effect for the cause, and an analytical trend, or inventiveness as to development. The success of these abilities, when used with practical application of chemistry, physics, mechanics and capital, has been extraordinary in the blast furnace field of the last decade or so.

It is easier to analyze the progress and trend of a decade than of a year. Over such a short period, what constitutes advance and trend is apt to be colored by opinion rather than demonstrated by results that are sufficiently sound and applicable to all materials and conditions to be enduring. But few factors stand out in 1928. As a background, the blast furnace industry continued in a period of intensive competition, overproduction relative to consumption, underproduction relative to capacity, transition of productive capacity and locality, no new construction and considerable reconstruction.

Problems have been met, under these conditions, by the industry in an energetic manner. The cost of production has been lowered through multiplying work by mechanical means, through eliminating unnecessary work and expense, through careful planning and management; thus an increasing amount of iron has been made with the same people at work. The blast furnace has also again increased its unit output. These are means conventional to all industry. But increase in unit output is not so cursory a matter in the blast furnace as in the mine, factory, or even rolling mill.

Marked Advance in Controlling Operations

PROBABLY a significant fact during the last year is that increase in unit output has gone hand in hand with an increasing advance in control of the metallurgical process. It is significant because the control factor of the blast furnace process has always been considerably developed, and because the advance in control has been effected in factors characteristic of blast furnace operation since the advent of Mesabi ores.

The lack of application is not due to underestimating the importance of the factors to driving rates, overall economy or loss, though probably underestimated as to effect on practicability of increasing furnace size. Also there would have been little financial return from these factors on small furnace units which, until recently, have

worked on a nearer approach to ideal than large furnaces. And many other major problems of design and equipment had to be solved first on large units.

Last year has seen striking advance in control of blast heat, distribution and manner of distribution of wind, blast pressure, charging of the stack column as to lateral and vertical component displacement, maintenance of regularity of level of column and of charging, and observation of furnace movement. There have long been means of noting such factors, but only recently have more absolute control means, direct and indirect, been adopted. These advances have justified the high capital expense of large units, as they have given increased output of a given unit, with less fuel consumption and lower loss.

When one scans the items of present day "cost above material" costs, or reduces each such item to a percentage of total pig iron cost, the conviction is forced that on present costs of labor and materials, the major improvements in primary cost are to be expected in increased tonnage, decreased fuel, lower loss, and increased gas credit. These in themselves, and also by insuring continuous operation, decrease secondary capital cost. Tonnage, fuel and loss are favorably influenced by the advance in positive control of the last year.

Blast Furnace Gas Used in Coke Ovens

A SECOND application, for the first time in America, was put into practice last year at two plants, namely, the application of blast furnace gas to the underfiring of by-product coke ovens. The practice has been followed abroad for over a decade, induced both by the wide distribution of coke gas and its use in steel mill furnaces. Substituting blast furnace gas for coke gas at the ovens has usually resulted in a lower pushing temperature, or an increased heat input of the low heat value gas. The return is such, however, in the sale of coke gas as to make the tie-up of blast furnace and coke plant on this basis a sound manufacturing proposition, in distinction to the hazard of the merchant furnace operation.

Three plants made application of blast furnace gas to steel works departments, where, used as such, or in combination with coke oven gas, it is displacing producer gas. This is a significant tendency, as it will prove more lucrative to use blast furnace gas to replace coke or producer gas than to generate power.

In most localities, provided there are these other uses for blast furnace gas, power may be more cheaply produced from powdered coal than from gas. Also, with the usual demand and energy charge, power may often be more cheaply purchased from utility companies, provided there is an adequate standby or paralleling set operated by the plant.

Aside from the decrease in pig iron cost from the increased gas credit, the tendency toward these diversifications in blast furnace gas use will have important reflexes, in that increasing emphasis must be put on regularity of blast furnace gas supply, quantitively. Also, with a better market for the gas, increasing attention will be paid to economy of use in the blast furnace department itself.

Promise of Fine Gas Cleaning

AFTER some indecision, opinion may be crystallizing toward fine gas cleaning, rather than the tower washer of the past decade, or a compromise between tower washer quality or disintegrator quality gas. This tendency may be forecast by the importance of regularity and extraneous gas uses mentioned. With the adoption of such quality of gas is going the installation of highly efficient hot blast stoves, effective not only in economy of gas, but in sustained blast heats and in heat reserve.

This is a noteworthy trend, for it is developing in the absence of any pronounced tendency toward the use of high blast temperatures. There are few plants, outside of certain merchant furnace operations (which for market, material, or cost considerations, use high heat and relatively slow driving), that find it paying to use heats above 1350 deg. Fahr. Our Lake ores, in their natural state, are not in condition conducive to best regularity of output on high heats, except occasionally, or in exceptional cases. There should be a considerable advance in ore preparation on a sufficient proportion of the ore burden to permit a better utilization of high blast temperature. With this will go a good increase in output and decrease on costs. Sufficient showings have been made over some months of operation to indicate the soundness of the practice.

Equipment Available for 1500-Ton Furnaces

IN the equipment line, there have been introduced improved dust catchers, stove linings, mud guns, stockline recorders, tuyeres, charging control, and gas washers. Turbo-blowers of 100,000 cu. ft. capacity are now practicable; 30 ft. bosh furnaces are in sight; charging equipment in bins, gates, cars, hoists and tops are available for 1500 tons production per day; considerable work has been done in modification of bell sizes and operation. Flue dust production has been cut by one-third at some plants and will be still further reduced. A coke ratio of 1600 lb. of coke to one ton of iron is being done, and without excessive scrap; 1400 lb. of coke per ton will be done. Attention is increasingly given to control of coal preparation and coking, and to daily tests of coke as delivered from the oven.

With the present foundation of fundamental equipment and knowledge, of mastery of materials, and control of process, we have not reached, if approached, the reasonable limit in blast furnace output, or in economies of production cost. This is plainly evidenced by the difference in outputs and production costs at different plants in a given district, relative to present sales prices. An analysis of the components of these production costs, to reveal the economies and savings characteristic of each plant, or the conditions conducive to enhanced output, throws a remarkably interesting light as to the possibilities of new or remodeled plants.

Frederick Hartwell Willcox, a graduate of the Massachusetts Institute of Technology, is vice-president of the Freyn Engineering Co., Chicago, which he joined in 1917. For ten years he had been identified with blast furnace work for steel companies and the Bureau of Mines and he has invented gas burners, gas washers and other apparatus.

Prospects Not Bright for Conventional Plants

VISITS abroad in 1927 and 1928 are convincing as to the advance that American blast furnace plants represent in construction, practice, and personnel over English and Continental plants. Granting that refinements of foreign practice are logical of adoption, such as stoves,

tuyeres, washers, heat economy programs, etc., on the whole, American blast furnace advancement is in step with domestic economic requirements, and rarely ahead of these requirements. For that reason, American development is intrinsically sound. The progress of the blast furnace plant is today based on a sounder and broader perception of economic and technical factors than before. There may be expected a continued advance, due to commercial considerations, competitive conditions, and operating and engineering resourcefulness and ideals, that will equal the progress in the blast furnace field of the past decade.

There is a corollary to such progress. It may cause the loss of considerable amounts of invested capital, now represented in conventional plants, steel works units, as well as merchant furnaces. One decade has seen the wiping out of a considerable proportion of merchant furnaces in Virginia, Pennsylvania, Ohio, Wisconsin and Tennessee. It has seen works continue to run at capacity output of finished steel, with but 50 per cent to 70 per cent of the same steel works blast furnace units in ordinary operation.

With advancement in unit tonnage and in cost reductions, with the trade unprepared for control of production, or without means for the increase of consumption, the plain prospect would seem that the tendency toward increase of unit production and cost reductions on remodeled or new plants will throw more iron on the market and cause lower prices than the margin of profit on conventional plants will meet, should such plants confine their perspective to short term betterments, or fail to take advantage of groupings such as to permit better balance and utilization of available outputs and equipment. And though of late there is considerable argument as to whether the public interest is best served by too much progress in, and expansion in invested capital for, increased output and betterment of cost in basic industries, nevertheless, from the viewpoint of technical progress and economic soundness, there is every reason to expect the trend toward larger units of blast furnaces, increased economies, better equipment and sounder control to continue.

Gray Iron Abreast of the Times

Plant Mechanization and Large Output Recent Developments—New Institute a Benefit—Technical Improvements Numerous

BY DR. RICHARD MOLDENKE

PRODUCTION of enormous tonnages of repetitive work in growing single foundry units is unquestionably the most noteworthy development of the year in the gray iron industry. The automotive industry furnishes the best examples of this, and every new plant seems to vie with its predecessors in putting the foundry division on a mill production basis. Other branches of the gray iron industry exhibit the same tendency, one having only to note the great expansion of the cast iron pipe units, radiator production; in fact, everything connected with building and public service.

Hand-in-hand with this expansion in volume goes the mechanization of the plants to a previously undreamed of extent, and manual labor is being supplanted by machinery at every turn. With molten metal poured into work in one well-known foundry to the extent of more than 1000 tons a day, and a second unit in the same establishment almost ready to double this figure; with other great foundries not very far behind, one finds it difficult to appreciate fully the demands made upon the resourcefulness of the management and the skill of the operatives in filling the required schedules. The successful accomplishment of the tasks laid out ahead by the pressure of economic development is surely a proof of the stability of the gray iron industry and its ability to advance with the new order of things.

Well Known By All Foundrymen, Dr. Moldenke Is a Consulting Metallurgist at Watchung, N. J.

A better understanding of the cupola melting process and the application of this knowledge to continuous melting is the key to this successful accomplishment. Being able to maintain a constant stream of molten metal during the entire working period of the day, has allowed the rapid advance of foundry mechanization. With competent metallurgical and mechanical skill available, problems in foundry procedure are solved as fast as they present themselves. American enterprise, backed by unlimited wealth, does not hesitate in plant expansion, under the impetus of wise consolidation of interests.

The increase in production in fewer but larger foundries seems destined to continue and become even more marked as time goes on. Simplification in practice will become more general; demand for quality more imperative; and, through cost reductions incident to increasing quantitative production, the values given the purchaser will constantly rise.

Gray Iron Institute an Important Step

AS a direct outcome of the recent practical examples illustrating the above mentioned tendencies, there is now organized the Gray Iron Institute of America. When the writer, who has been in close touch with the British and the German work of cast iron research, first suggested the formation of such a body within the foundrymen of the country, on the occasion of delivering an address before the Philadelphia Foundrymen's Association, he had not reckoned with the fame of Philadelphia for sponsoring important new movements. Philadelphia took up the question of cast iron research for business and for quality seriously, and together with the Ohio Foundrymen's organization—East and West united—made the call for North America. The formation of the Gray Iron Institute is distinctly an achievement of the year 1928, and it enters a field of wide and useful possibilities for the industry.

Coming now to the details in the technical advances of the year, the most important is the growing knowledge of how to make "high-test" cast iron. This, by the simple process of melting the mixtures in the cupola at as extremely high temperatures as can be gotten by careful charging, the use of much steel scrap and by forgetting unwise economy in coke. Such molten iron, intensely superheated, is allowed to cool to normal pouring temperatures before the molds are filled. The results, as compared with the same mixtures melted colder, are astonishing, and will go far toward re-establishing the position of cast iron in the mechanical world.

The expanding use of agents for beneficiating cast iron such as nickel and nickel-chromium—whether in the Mayari ore pig irons, or added directly—deserves more than passing notice.

In cupola melting practice, pre-heated blast, long known in the foundry but never worked out systematically, has acquired permanent footing—now that continuous melting has made the development worth while. To this should be added the attention now directed toward the removal of moisture from the blast, and thus preventing unfavorable effects on the descending drops of molten iron by water-vapor. In this connection, the supply of a constant oxygen weight at all times, by a centrifugal blower brought out by the General Electric Co., deserves careful attention. All these things show that advances are under way, all of them tending to help make a mill schedule in the foundry safer than it was before.

Centrifugally cast iron pipe is crowding the production of the ordinary type of this foundry product. Sand benefication by clay-bond additions is becoming quite general. This points directly to synthetic sand as the final result of the tendency—indeed, artificial sand is used in many establishments already.

Cores made with a rubber binder is a distinct achievement of 1928, and this time a Government Bureau has scored heavily for the benefit of the foundry. Standardized group cost-keeping has advanced steadily during the past year. Blast furnace men are working better with the foundrymen, now that much ventilation has been given more or less well-founded difficulties with pig iron.

And so the general trend for the coming year is in the direction of quality work in ever greater tonnages produced in ever larger, thoroughly mechanized units, a union of brains and endurance devoted to "production" at maximum speed and with minimum losses at all times.

Two Developments in Steel Casting

Better Product to Meet Severe Demands of Industry—Cooperative Advertising a Success—Larger Use of Alloy Castings

BY JOHN HOWE HALL

FOUR years ago, in accepting the J. H. Whiting medal of the American Foundrymen's Association, I stated that steel foundries could then make two or three times as good a casting as they had ever educated their customers to call for, and that their biggest job in the next ten years would be to "sell" their customers on what they could make and what, in the long run, it was to their advantage to make—namely, the best casting they knew how to produce. Since I made that prophecy, it has become increasingly evident that I was right, and that the foundries that are succeeding and building up their volume of sales, are the ones whose managements are striving each year to make a better casting than they did the year before.

Mr. Hall is Metallurgical Engineer for Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

There is no single cause for this situation. It has been brought about partly by the demand for materials that will better withstand the increasingly severe service to which almost all machines are being subjected. It is partly owing to the competition among steel foundries for an available volume of business that was too small to fill them all to capacity. It is partly also the result of competition of other materials offered as substitutes for cast products.

Autogenous Welding as a Competitor

IN the last few years, for instance, the art of autogenous welding has been so far perfected that engineers now accept articles built up of welded structural material in many cases where castings were formerly employed. Up to the present time this has affected the business of the iron foundries far more than that of the steel foundries.

The makers of welded articles, however, are supported by a well organized and financed publicity campaign, and the steel foundries see clearly that, in order to meet this intensive competition, they must so improve their present product as to make its undoubted superiority to welded material even greater than it now is. This is especially true because of the tendency of the advocates of welded material to harp upon the good points of the rolled material of which their parts are made, and to "soft pedal" upon the low strength of the welds themselves, particularly in fatigue.

Growing Demand for Construction Machinery

IN the years since the war, the restrictions upon immigration have caused a wide-spread substitution of machines for manual labor in thousands of jobs throughout the country. Especially is this true of engineering projects involving the handling of great quantities of earth and rock. Then, too, the extraordinary growth of automotive traffic has necessitated the development of equipment for keeping roads open that until recently were allowed to snow full, and for hauling supplies to regions that formerly required only horses.

Much of this equipment for excavating, moving, and hauling materials has been built for only a few years, and as each season passes, its performance, at first regarded as almost miraculous, is taken quite for granted, and a still higher standard is looked for. The result is a demand upon the foundries for a better and better product, each year that the machines are in service. There is, too, a curious tendency of the human mind to measure the service of machines only by the number of days they have been in operation, and to register emphatic protests when a machine, or a part, lasts only 40 days this year, when the previous year it lasted 60 days. In many cases a far greater tonnage of material was handled or moved in the 40 days than in the 60, but that fact is lost sight of when the necessity of buying new parts arises.

Apropos of this, an executive of a steel foundry making castings for resisting heavy wear once told me that, if one were to judge by the "kicks" received from some customers, one would have to conclude that the only year when his shop had made really good steel was the first year they were in business! Although this tendency to over-state claims is widely recognized, yet it is realized, too, that it arises from the fact that the machine users are bound to work them harder and harder each year, and to buy only those that "stand the gaff" on the job. The maker of the machine, of course, passes on the demand for better material to the foundryman, who has to meet the demand, or see the business go to a competitor.

Steel castings, too, in machines that have been manufactured for years, are to-day expected to stand up to heavy service as never before. No more striking instance of this could be found than the modern locomotive engine, which is not only built larger and heavier each year, but is expected to make long runs with only a change of crew at division points where formerly engines were changed as well as men. Castings used for vital parts of these great locomotives must to-day be made of a grade of steel such as would have been regarded as a dream of the enthusiast a dozen years ago, and the end is not yet.

Greater Use of Alloy Steel Castings

CONDITIONS outlined above have led to two marked developments in the steel foundry industry, which have been especially evident in the last year or two. The first of these is the widespread tendency to substitute various special compositions and heat treatments for the "soft" or "medium" steel, "full annealed" or shipped "as cast," of a decade ago. This is not the place to discuss the relative merits and demerits of the different alloy steels being manufactured and sold for various sorts of severe service, nor to comment upon the suitability, or the reverse, of the heat treatment processes employed. The point I wish to make is that to-day as never before, heat-treated steel castings, and even heat-treated alloy steel castings, are coming to be familiar articles of commerce. The trend in this direction has been especially marked during the last year or year and a half, and it may be expected to increase rather than decrease.

Theodore Roosevelt spoke once of the "lunatic fringe on the skirts of every new movement," and it may not be out of place here to speak of a somewhat similar infestation in the case of the movement toward better castings: I refer to the manufacturers, fortunately growing fewer each year, who try to win business by pretending to be producing a superior article, to which they give a high-sounding name, without taking the trouble and going to the expense of turning out a genuinely improved material.

Frequently, to judge by the product of these shops, the reason why their advertising efforts are "full of sound and fury, signifying nothing," is because they have no one in their employ who understands how to turn out the improved article that their advertisements claim they are making. The result, of course, is that the new product is, if anything, rather worse than the plain steel casting formerly sold, which their staff understood how to make. These concerns, like small boys "hooking on behind" the big sleighs in the days of our childhood, will gradually fall by the wayside, yet they will to some extent hold back the movement of which they attempt to take an unfair advantage, by giving the genuine article a "black eye" in the trade.

There has been a marked tendency, also, for both manufacturers and users of steel castings to seek to ascertain the properties, not simply of the steel of which the castings are made, as shown by "coupon" tests, but of the castings themselves as integers. Some of the debates on this question have grown quite warm at times.

There has been a great deal of research work directed to throwing light upon the strength of the metal in various parts of castings, which will eventually be of great benefit to all concerned, as it will teach the foundryman how to make castings better at all points than those he formerly produced; and perhaps even more important, it will teach the designer the limitations of foundry practice, which in far too many cases he has been disposed to blandly ignore, designing and demanding castings that no human ingenuity could possibly make truly sound.

Cooperative Advertising of Steel Castings

THE second development of which I spoke above is really a result of the first, and that is the steps that are being taken to bring to the attention of the engineering public the improvements in steel castings that the foundries are making. This movement, of course, arises from the realization that it is of little use to make improvements in a product unless active steps are taken to advertise those improvements as fast as they are made. Accordingly, various bodies of foundrymen are giving increasing attention to the task of advertising the merits of their product.

In particular, a new organization has been started of eight or nine steel foundries making quite similar lines of work, for the purpose of carrying on cooperative research designed to improve their product, and to advertise the product of the member foundries. This cooperative effort, of course, is modeled upon that of the successful group of steel foundries that has been in existence for several years, and that has contributed so signally to the improvement, not only of the product of its member companies, but of that of all steel foundries as well. Similar organizations, of course, have for some time been in existence in other industries; the steel foundries were not the first to initiate such group activity.

One significance of the founding of this new group of cooperating steel foundries is the proof that it gives of the success of the principle of cooperative effort and advertising, as exemplified by the existing organization. Foundrymen outside of both groups, therefore, recognize the starting of this body as an important mile-post in the history of their industry, and wish the new venture the same prestige and success that the able management of the older group has won for it.

Tubular members for dirigible framework are much to be preferred to the slender ones made of sheet duralumin pressed into channel shape, according to tests at the Bureau of Standards. The added stiffness against twisting while under compressive load increases the collapsing stress as much as 50 per cent. Corrosion of the interior walls of tubing, unrevealed to careful inspection, is a danger which has prevented wider use of tubular members. Some light aluminum alloys have developed unexplained and erratic brittleness, possibly the result of atmospheric oxidation.

Open-Hearth Developments in 1928

BY LEWIS B. LINDEMUTH

EXCEPT in those years when ther eis some radical departure from usual open-hearth procedure, it is difficult to appraise the amount of progress which has been accomplished in so short a period of time as one year. The immensity of the industry and the diversity of conditions under which the same ultimate results are to be accomplished would not permit such an evaluation, even though there were developed a pronounced departure of apparent merit under localized conditions.

The most significant sign of progress is the spirit of cooperation and open-mindedness displayed during the year by members of the Open-Hearth Superintendents' Committee of the American Institute of Mining and Metallurgical Engineers. Other evidences of the same group action are the researches under the direction of the United States Bureau of Mines in Pittsburgh, financed by a number of important steel companies.

Through these mediums the entire talent of the country is being consolidated to solve individual problems, and to record experiences favorable or unfavorable about various operating conditions. Such cooperation must eventually effect far greater progress than would ever have been possible under any other circumstances.

The year 1928 has been one of profitable attention to those things which have been too frequently considered minor details, but which have now been promoted to major considerations. However, there is still much to be done in removing the rule-of-thumb and introducing a more scientific spirit. Even in those plants where the most intelligence is exhibited, the officials realize there is room for improvements in details, each one of small importance, but in the aggregate amounting to worth-while savings. In other places where the supervision is less effective, the melters too often operate their furnaces as they did years ago, oblivious of the possibility that the raw materials, the specifications, the fuel, even the furnace itself have changed so much that the old routine is wasteful of time, heat, and slag forming materials.

Thus while one may find some reason for criticism in most plants, and while the year just past has been devoid of innovations in furnace design or operation, the passing months have built the foundations for steady progress to a degree of average excellence impossible without ready and frank interchange of information.

Tendencies toward changes in practice are not necessarily a criterion by which progress can be measured. One plant might adopt a practice or modify an existing one, while another was discarding the same practice or modifying it in an opposite way, and each would progress. Yet one could mark no apparent change in the industry as a whole. Most of the noteworthy events during 1928 were of this nature.

Physical requirements of the steel are becoming more exacting, and economical production more imperative. Hence operating problems, and modifications of designs of existing furnaces (in order to utilize better the available construction materials and to promote fuel economy) have occupied the greatest attention.

Certain definite tendencies instituted in previous years have been carried on through 1928. The most interesting of these is the completion and operation of a 300-ton stationary furnace by the Wierton Steel Co. This furnace was built after about a year's experience with four furnaces of 250 tons capacity. It justifies the expectancy which prompted its construction, and would seem to indicate that the economical limit for size is governed by the strength of buildings and by the accessories rather than by considerations of the practical working of the furnace itself.

Other plants during the year, notably the Illinois Steel Co., have increased the size of some furnaces to the maximum of the handling facilities for liquid steel. The question of quality of the product and the size of the furnaces seems definitely to have been settled in favor of the large furnace, either tilting or stationary.

Automatic regulation of all types of fuel and incoming air has received more than the normal amount of attention. Neither the feasibility nor desirability for general use of complicated control equipment has yet been determined. A mixture or blast furnace gas and coke oven gas is being used with apparent success by one of the large independents. Actual economies have not been made public. Fuel of this nature has been more extensively used in Germany than in this country.

Best Machine Tool Year in a Decade

Advances in Design and Performance Have a Financial and Social Significance Which Calls for Close Study by Users

BY F. A. SCOTT*

TEN years have slipped by since the World War ended and business men began once more to try to view business as a normal process. At least eight of those 10 years have constituted a period of trying and even violent readjustment in many industries. In those lines of manufacture greatly stimulated by war, notably iron and steel and machine tools, in this country and abroad, the readjustment may be said to have culminated in 1928. In any case, it will probably have to be admitted, in the United States at least, that the steel manufacturers and machine tool producers who can not show a profit for 1928 come under severe scrutiny and are probably open to criticism. In other words, iron and steel and machine tools in 1928 at last began to feel the benefits of improved designs and better production methods, as well as the cumulative effect of stringent economies, price readjustments, and sounder trade practices, all of which were forced by the competition which naturally followed the collapse of war demand.

Machine tool manufacturers during 1928 will have enjoyed their best year since the war and, although earnings of most producers will still be well on the modest side, the year's experience presages a return of a situation wherein results may once again be expected to rest on character of product and management.

Epoch-Making Advance of Last Decade

SO extensive has been the change in production methods and machine tool possibilities, during the decade just ended, that metal-working plants which were highly efficient and up-to-date at the close of the war would be hopelessly outclassed to-day if, in the meantime, they had not retooled. A steady change in metals to be worked and in cutting tool materials has produced corresponding extensions in the power and speed of machine tools.

Roller and ball bearings; automatic lubrication; automatic, pneumatic, and hydraulic feeds and controls have lessened the labor required to operate such machines and greatly increased the accuracy of their operations and the volume of output.

Moreover, the higher production possible with the newer types has stimulated the adoption of bonus systems for increased production at lower cost, so that the changes represented by engineering improvements have become financial and social as well as mechanical. It follows that there will be discrimination on the part of machine tool operators seeking employment between shops where modern tools predominate and those where older types still call for more manual effort and limit the prospect of additional compensation. There will be intangible results of this nature accruing to the up-to-date plants which can not be defined accurately even after they have been experienced. The automobile industry continues to be the one which can be cited as willing and eager to accept every recognized advance in both material and machinery, and which holds as a consequence a position of unquestioned leadership.

Demand from All Fields

THE demand for American tools during the past year was greatest, as always, in our own country; but foreign markets also made a large contribution, the largest, it is safe to predict, since the war. The demand throughout this country was typical of those years in which the whole vast buying power of our people appears to be exerting pressure. In no other way could be explained the need for new machine tools in all fields from aeronautics to tractors and from automobiles to washing machines. It would be far simpler to list the few lines of manufacture which did not call for new tools than to enroll those which did.

Demand for machine tools may originate from several causes, and this year all of these various forms of stimuli were active. Tools were purchased for new plants or enlargements; for replacing worn-out machines; for substitution of obsolescent equipment; for increasing production and lessening costs by replacing a less efficient by a more efficient type with greater production possibilities. The keen competition in most metal-working industries, especially the automotive industry, continues the pressure for such machines as will lower costs; and thus, at last, those machine tool manufacturers who have borne the cost and the risk of introducing new designs are beginning to reap the benefit of their initiative. In addition to all other causes, the business this year received notable impulse from the expansion of aeroplane plants and from the readjustment of the American tractor business consequent upon Ford's withdrawal from that field.

Prices Will Continue Upward

THE experience of the machine tool trade as to prices has rather strikingly resembled that of the steel industry. Generally, there has been recognition of a need for advances; somewhat less generally, advances have been made but even where made have been less than would be justified by the returns or the comparison of the profits of the vendor with those of the buyer.

In both industries, since the war, there has been an increasingly strenuous campaign to educate producer and user to the importance of attaining a basis of price readjustment low enough to assure volume and high enough to produce a fair return. Both industries have presented the phenomenon of the type of optimistic producer who hopes by volume alone to escape loss, and the optimistic buyer whose range of credulity embraces a vendor who can thrive by some process even when consistently denied a profit.

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The Trojan horse is still remembered, and it would be helpful at times if the keen buyer would also recall the horse which could have been maintained on a diet of sawdust but for its untimely demise just as it had learned how.

Machine tool price increases thus far have by no means absorbed the costs represented by the engineering and production of new designs. The fact is well known that many machine tool concerns have paid no dividends since 1921. Their capital has remained unremunerative during a period when many of their customers were enjoying unusual prosperity. There, of course, will be an effort to restore a balance in the industry. Therefore, the trend of prices will continue upward.

A Measure of Machine Tool Leadership

NOWHERE is the American industrialist better served than by those who produce our iron and steel and machine tools. Our national efficiency in these lines has assisted our metal workers, particularly automobile manufacturers, to attain world supremacy. Therefore, it is beneficial to our whole industrial fabric that these lines again appear to have reached an era of understanding between producer and user which will keep them strong and serviceable. This understanding of the necessities of a trying situation has not been reached a bit too early, for there has been evidence enough during 1928 that metal-working competition from England, Germany, and France may now be expected to become increasingly severe.

The machine tool equipment of countries may be said roughly to correspond with their volume of iron and steel production, plus the degree to which such iron and steel tonnage is refined and diversified in its fabrication. This, then, affords a rude but serviceable gage for measuring potential machine tool markets. Using this measure, the United States possesses a machine tool equipment equal to that of the rest of the world, for it is well known that our iron and steel production is equal to that of all other countries combined.

But in our case there is still the remaining factor of diversification of products which makes the comparison even more impressively in our favor. Our automotive, electrical, farm implement, railroad equipment and other industries have advanced their designs and machining methods so far as to give them world leadership. It must follow that as other countries extend their steel production and, consequently, their metal-working industries, they now must come to the United States for their methods and, to a less extent, for their machinery.

There was a time in the early history of machine tools when England held first place as a machine tool producer. This leadership soon passed to the United States, and the war experience of vast quantity production seems to have made our position even more secure. It is fortunate for our industries and for the world at large that the American machine tool manufacturer realizes the responsibility which goes with leadership, and, thus far at least, in both designing and pricing his product has held strictly to the modern conception of service in business.

In line with other American industries, the machine tool trade has adopted the policy of lessened inventories. This may result in delayed deliveries during a period of wide-spread demand; but it also may lead to a new and healthier system of buying on the part of machine users. A certain volume of hasty machine tool buying due to the acceptance of new or unexpectedly large contracts is normal and will always be present; but in the case of well-established concerns the time to buy machine tools is not during a period of exceptional prosperity and "rush" business, but during the quieter times when requirements and possibilities can have careful study by the best engineering talent of both buyer and seller.

If this system of buying can be extended, its effect on our metal-working industries will eventually prove most beneficial. "Any port in a storm" is a safe doctrine, but the best dock at the port most desired is still better. The virtue of "calling a spade a spade" has been widely advertised; but the advantage of considering one spade just like any other, because it is called the same, does not appear. Apply that to the buying of machine tools, and the advisability of purchasing during a period when the buyer is not driven by necessity will be obvious enough. Only a few years ago the question of the buyer was: "Will this tool do the work?" Now the question is, or should be: "Which of these machines will do the most work at the lowest cost?" The answer to the latter question requires more time.

Installment Buying Is On the Increase

INSTALLMENT buying on a modest scale exists in the machine tool industry, and although state laws and credit practices make the system a puzzling one, nevertheless it is steadily and helpfully extending. There has been some hesitansy to promote installment buying due, perhaps, to the criticism by certain bankers and economists of that type of salesmanship. Any reasonable observer now recognizes that those warnings were overstressed.

Installment buying has certainly justified its introduction and has been responsible for expansion in various lines which would have been impossible without this aid to salesmanship. One thing for the office economist to remember is that stimulated demand creates larger volume and this, plus expanded facilities, often means lower cost of production and a widening of the base of the consumer pyramid. The lesson taught by the sewing machine and the Ford car should never be forgotten.

There has been some progress in the endeavor to secure recognition by the user of the cost of engineering services rendered in user plants. One group of tool manufacturers has already agreed on a charge for such services.

The effort to establish uniformity of method in appraising used tools has also been continued with some success. A considerable obstacle in the way of this project is created by the variety of methods of marketing machine tools in this country. Certain leading manufacturers sell direct; other leaders sell through agents; still others follow both methods; the whole constituting a confusion of methods and interests which make difficult, if they do not defy, all efforts at standardization. However, the subject has been dealt with candidly and in a spirit of friendliness which makes improvement not only possible but exceedingly likely.

Neglectful Attitude of Railroads and Mines

WITH a few exceptions, the machine shops of our railroads and large mining operations continue to be the neglected children in the metal-working family. The explanation probably is that the controlling minds in railroading and mining are required to do their best thinking in fields less obscure than their modest machine shops. But, whatever the reason, the fact is so venerable that its reiteration by machine tool makers has become tiresome.

Both the railroad and mining industries would be benefited by a broader and more liberal attitude toward their machine shop requirements and possibilities. Up to this time, shop requirements have been the first to experience curtailment and the last to benefit from expansion; and railroad buying for machine shops has frequently been on price, rather than on production possibilities and savings in operation.

In this particular, our railroads present a marked contrast to the far-sightedness exhibited in their other fields of activity, and many of our large mining projects may

fairly be included in the same category. On the other hand, oil well supply interests have been alert to obtain modern tool equipment and some of the "best tooled jobs" —to use a machinist's phrase—to be found in our country are in the plants of oil well supply manufacturers. Where competition is felt directly by the producer, we are likely to find efficient production methods.

Prospects Bright for 1929

PROSPERITY can remain so long absent from an industry that its return is greeted fearfully as something which must soon depart. It is a fact that there are many high-grade machine tool producers who this year for the first time since the war will dare declare even a modest dividend from profits, and already expressions are heard that a keen outlook must be kept for a return of hard times!

Data now available would seem to make it easy to forecast 1929. The value of farm products harvested in 1928 approximates that of 1927; therefore the buying power of the farm will contniue high. The buying power of the industrial worker and the employee groups in commerce and transportation will be higher in 1929 than in 1928. Recognition of this may be observed in the optimistic schedules of the automotive industry for 1929. The automotive program, plus building construction and road projects, farm machinery, a better railroad demand than in 1928, and countless general requirements will assure a heavy steel production. All of the above, and, in addition, an expanding aeroplane industry, will contribute to the machine tool demand.

There appears no disquieting factor except an inflated stock market with its possible threat to money supply. Even in the fields of politics and statesmanship, this year, the indications point toward policies which will sustain and even extend the volume of prosperity.

Manufacturing Economies Effected in Machine Tool Plants

BY ERNEST F. DU BRUL*

PROGRESSIVE managers in the machine tool industry, like those in all other industries, have been studying and practising cost reduction during the last few years. The directions that these efforts have taken can be summarized as:

1.—*Better utilization of facilities already available*
2.—*Installation of improved facilities*
3.—*Reduction of costs by eliminating unnecessary sizes*
4.—*Reduction of costs through standardization of parts and components*

Some machine tool builders have been able to reduce costs in all four of these directions. In other cases cost reduction has been possible in only one or two of them.

It is impossible to estimate the total extent of cost reduction for the whole industry, but certain specific examples of the application of each of these methods show what can be done.

1.—*Better utilization of existing facilities.* One company, which was more than normally efficient and successful, attacked the problem from the managerial point of view by making a fundamental analysis of the progress of work through the shop. Many criss-crossings in the paths of the component parts of the various machines manufactured were found. Having a large amount of floor space available as a result of war construction and a large amount of equipment provided during the war, the company decided to arrange the latter so as to divide the whole shop into a series of departments, each equipped with all kinds of machine tools necessary to make complete sub-assembly elements. They then established a progressive assembly line, using trucks to move the machines. This made the foreman of each department supreme in his own little domain. It put all the responsibility as well as the authority for the production of his assembly units on his shoulders. Cross hauling of parts from operation to operation was cut down tremendously and the expense of planning, scheduling, and cost finding was minimized. This rearrangement did not involve any change in the equipment at the time of installation, although some new equipment has been purchased since.

2.—*Installation of improved facilities.* Some other companies in studying their costs from the equipment point of view have, like other progressive manufacturers, found many places in which newer types of machinery would pay very handsome dividends on their cost of acquisition, and many items of new equipment have been installed throughout the machine tool industry.

New equipment has been found to reduce cost, first, by cutting down the man-time element in production; second, by improving the accuracy of the product in working to closer limits, and third, by eliminating hand operations in fitting, etc., due to the better quality of the parts supplied assemblers. All this is, of course, experienced by other manufacturers who study their equipment problem.

3.—*Simplification.* Several machine tool builders have reduced their line as to number of sizes offered. They have got away from the idea that wide choice as to size is good for either the user or the builder. They have analyzed their sales and have eliminated the slow moving sizes which had become parts of their lines merely because of lack of analysis and careful consideration.

Besides this, some builders have found it to contribute greatly to cost reduction to use the same elements in different sizes of machines. An engineer may argue theoretically that this makes some elements stronger or larger than a small size machine should have. Practically, however, this has not been found to be detrimental to the user. It has been exceedingly advantageous to the producer in that it cuts down inventory. It also increases quantity production of the elements used on different machines, and thereby reduces cost.

4.—*Standardization.* Some of the shops had given a great deal of study to standardization of parts, material, etc. This has produced exceedingly beneficial results. As an example of what has been done in this particular, one company spent $50,000 over a period of three years in the development of internal standards. In 1928 the demonstrable economies for the same amount of production that was had in 1927 would amount to $200,000. But as the business of 1928 was probably 25 per cent more than that of 1927, these economies would be no less than $250,000 for the past year, and of course the same rate of economy would continue in the future.

The 1928 expenditure on further standardization will also pay a good dividend on its cost. Certainly a dividend of 500 per cent a year is a very handsome profit on the money spent during three previous years on standardization. Lest one think that the previous management of the company was lax, it should be said that the company always has been exceedingly well managed. There is no doubt that proportional results would follow the same kind of work in many other cases.

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Prospects Bright in Drop Forgings

Shops Have Met Rising Exactions of Buyers But Industry Needs Cooperative Effort—Expansion Keeps Wide the Gap of Excess Capacity

BY J. HARVEY WILLIAMS

IN the drop-forging industry, 1928 has been marked by a considerable increase in demand and, to a smaller extent, an increase in production capacity. This increased demand has in large measuse been stimulated by the greatly increased motor car output. In the case of the many forging companies which cater almost solely to the automotive industry, this influence is direct; upon other units which do a more diversified business, the effect of automotive conditions is noticeable, even though more indirect, as automotive activity has spread its network into many metal working and other types of industry, all of which has reacted cumulatively to increase production and practically to eliminate unemployment.

Demand from the railroads has been a noticeable exception, the resumption of which, necessary before many months can pass, should serve as a buffer for 1929 against diminished demand from other directions. This is only another factor which, added to the fundamental soundness of prevailing conditions, should assure a period of activity for some months ahead, or as far as one may reasonably forecast at any given moment in any particular industry.

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Referring more specifically to the mechanical side of the drop-forging industry, it cannot be said that there have been substantial or radical improvements in the art itself the past year or two. Attention has centered more than ever perhaps upon short cuts that lead to greater production, since sales conditions among the companies doing a general forging business independent of the financial control of customers have been so competitive, with demand so far short of supply, that every slight economy has been required to balance the ledger. If effort along these lines has been directed in one direction more than another, perhaps it has been more noticeable in an increase of multiple forging where quantities have justified the extra die cost and also in efforts to increase furnace capacity and in closer control of furnace heats.

Forging equipment, particularly board hammers, has improved along the lines of greater ruggedness and a more generous use of steel castings. Roller bearings, inserted guides, and an increased ratio of weight between anvil and ram is gaining merited favor.

These improvements, together with more positive means for adjustments, make possible the production of forgings that are better matched and held to closer limits. The trend is toward closer size limits and less draft.

There is also a narrowing up of steel specifications, as well as the physical requirements, obtained by heat treating. This, in turn, is bringing into more general use electric furnaces, which have been greatly improved in recent years.

The increased automotive demand above referred to has applied not only to automobiles, but to trucks, tractors, and to their normal accessories. It has also extended in still greater degree to such items as shock absorbers, which have been adopted for the first time as standard equipment by a number of cars, including Ford, and which to that extent has represented new business for the industry wherever drop-forgings have been required.

Aircraft Demand of Measurable Importance

There has also been an increase of aircraft demand, but small in volume as compared with other automotive lines. We have, however, passed the point where doubt of the fundamental demand can longer exist, even though at the present time this demand is small in quantity and extremely exacting in such matters as tolerances and close inspection of materials, heat-treatment results, and specifications for minimum weight. To this general result the new Ford car with its replacement of castings by drop-forgings in many of its parts has added to the aggregate demand approximately 400,000 forgings per day.

Notwithstanding these conditions, however, industry figures still show production to be well below capacity at the same time that some managements have been entering the new equipment market. The fundamental effect of this can only be to perpetuate the past overcapacity conditions, for which this industry has been notable. This demonstrates forcibly the lack of industry mindedness from which this trade has so greatly suffered in the past for want of substantial cooperative effort.

Capacity is still largely unbalanced, both as to character and sizes of equipment, and also as between the many small independent units. The need for a clearing house for equipment as a protection for future years is thus clearly suggested. Largely because of this unbalanced condition, prices in general have undergone but a slight improvement, because the urge for volume where equipment is unbalanced still continues. The growing concentration of buying power through mergers constantly reduces the number of available customers and promotes instability.

There is, therefore, much need for greater cooperative activity in the industry itself before this industry as a whole can make the showing to which its experience, skill and effort entitles it, since the results in the more active years because of these conditions are not sufficient to offset the "profitless prosperity" of the lean years.

Secrecy Stays Die Casting Progress

Interchange of Information on Minor Developments Would Prevent Costly Mistakes, Avoid Duplication of Research, and Profit the Industry

BY SAM TOUR

DIE casting has made great strides in the last five years. Larger and more intricate castings are being made from an ever increasing variety of alloys. Prices have come down and the buyers are gaining more confidence in their real value. About $30,000,000 worth of pressure die castings has been produced in the United States in 1928, and prominent factors of the industry returned an attractive financial profit for the year.

Why is it that larger and more intricate castings can be produced on a smaller margin between metal cost and sale price today than five years ago and still show a profit? It is not because cheap labor is being used but because high grade men have been employed to do development work, to cut operating, handling and maintenance costs, and to reduce the percentage of rejects. It is well known that the largest producers of pressure die castings employ comparatively large staffs devoting a major portion of the time to development work.

Results of this work have been held as closely guarded trade information, consequently it cannot be said that the industry has reached any general level of excellence. Improvements which had been made two or three years ago in some plants have only recently been installed in others. For such reasons a review of the industry may best cover more than a single year.

Research Corrects Faults of Zinc-Base Castings

Tin and lead-base alloys were the first to be pressure die cast. Then came the zinc-base alloys. After a number of years came the aluminum base alloys. Zinc-base alloys meanwhile developed some very serious troubles: the alloys in general use were not stable, they warped and disintegrated with time. They fell into disfavor and aluminum die castings, then only made by a few companies, gained considerable popularity. About six or seven years ago some factors in the pressure die casting industry in collaboration with certain zinc producers started a search for zinc alloys that could be used in the process yet be free from the abnormal growth and disintegration. This work was successful; the new zinc alloys not only retain their shape much better, but have higher tensile strengths and elongations than the old. Thereupon the pressure die casting of zinc-base alloys gained a new lease on life and today its total yearly production is fully double in value that of the aluminum-base. Experimental work is still continuing, tensile strengths of pressure die cast test bars are reported as high as 55,000 lb. per sq. in. with 4 to 5 per cent elongation in 2 in.

As a result of increased confidence, and the increased quality of zinc-base alloys there has been a considerable shift from aluminum to these new zinc alloys. But aluminum has acquired many new outlets and the pressure die casting of aluminum has gone ahead by leaps and bounds. For many applications where weight and luster are important the zinc-base alloys are not adaptable. I estimate that the production of aluminum-base castings made during 1928 was approximately 20,000,000 lb.; zinc-base castings amounted to 100,000,000 lb.—both figures representing pressure die castings exclusively.

Superior Die Steels Developed

Dies for pressure casting aluminum have been made of a chrome-vanadium steel of the S. A. E. 6150 type, with the chromium up to about 2 per cent. The main troubles with this steel were warpage and change of dimensions during heat treatment, and thermal fatigue or heat checking during use. Hundreds of new steels were tried experimentally and new steels have been developed that have very largely overcome these troubles. In spite of a new defect in the form of large cleavage cracks, it is generally acknowledged that these new die steels are far superior to chrome-vanadium. Die steels containing nickel have been shown to be attacked far less by molten aluminum than was generally understood; other analyses containing considerable tungsten and chromium have proved excellent. Ten to twenty thousand waffle grids could be made from dies of chrome-vanadium steel; 50,000 to 100,000 may be expected from the new steels. Metal for dies is no longer the "neck of the bottle" in mass production.

Hydraulic and Geared Machines

Machines used for die casting aluminum are known as "air machines," as the metal is forced into the dies by air compressed to from 300 to 500 lb. per sq. in. In the early machines the dies were opened and closed by hand through a series of pinions, racks, and toggle joints. As larger and larger castings were attempted the dies became too large to be hand operated, and cylinders operated with 100 to 200 lb. air were built. Such air cylinders are not only very inefficient but they operate with so much jar and impact that maintenance and repair costs are excessive both on the dies, machines and the furnaces. An average of about 5 hp. in compressor room equipment is required merely to open and close the die.

Recent developments in casting machines have abandoned air operation; they operate either by hydraulic pressure at 200 lb. per sq. in., by oil pressure at 1000 lb. per sq. in., or by electric motors driving through gears and cams. In some cases the power required has been reduced from 5 to about 3 hp. per machine, even 2 and in some 1½ hp. has been achieved. In these new machines the "slam bang" of the air cylinder is absent and maintenance costs as well as operating costs are greatly reduced.

Certain so-called automatic and semi-automatic features have also been introduced. A semi-automatic machine is one in which the gooseneck, or molten metal retort, is interconnected to the die opening and closing mechanism so that it is brought up into place when the die closes and dropped back from the die when it opens. To this is often added a mechanism, again interconnected with the die opening and closing mechanism, which ejects the castings from the die after the die is open. Semi-automatic machines require a workman to operate levers which cause the die to be opened and closed, and those which apply air pressure when

the die is closed. In automatic machines the application of the air pressure, pulling of cores, and other actions, are included in the mechanism, so arranged that when the machine is started it repeatedly operates a cycle such as the following: close die, place retort of molten metal, apply air pressure, open die, pull cores, eject casting, push cores, close die and repeat.

Attempted Secrecy Harmful to the Industry

There has always been an attitude of secrecy about the pressure die casting industry. Each American company, whether large or small, has tried to build a wall about itself to keep out the prying eyes of its competitors. Misleading statements regarding practices, production and methods have been issued. To be sure many companies have made improvements which have given them a temporary advantage over competitors, but in the main this attitude has gained little. For every improvement developed by one individual dozens have been made by the others. The wall of secrecy has effectively barred the way to an interchange of ideas, and in an endeavor to hold secret some individual knowledge each has lost the opportunity of obtaining that possessed by many others. This has held up the progress of all, even the biggest companies, but still more the smaller ones which cannot afford large development programs and experimental studies.

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It is also true that secretive practices exist even inside the Chinese walls built around individual companies. Very few men in an organization are in touch with all its development work. The average employee or foreman, and even most of the executives are unacquainted with the entire program; each one comes in contact with only isolated portions of it. A die or tool maker knows that he has some special steels in his die but he does not know their compositions nor how they were heat treated, nor is he able to see how they stand up in service. He may learn their brand names but not much more. The machine shop foreman knows that he is making some special casting machine parts or some standard parts out of special materials but he is not in a position to see how they perform in service. The casting department foreman knows that certain dies are special and are being closely watched by the development men but he does not know just what the special features are. He knows that certain code numbered alloys are being tried out and although he learns the best operating temperatures and conditions, he does not know the composition of the alloy. He knows that certain of his casting machines have special parts in them either of new design or of new materials but he does not know the details nor the kind of materials used. The alloying department foreman knows that he is making certain special alloys in a specified manner but he does not learn how they work in the die casting process. The entire program is known to only one or two men who are in direct charge of it.

There is considerable shifting from one die casting company to another by such men as die makers, machine operators, tool room foremen, and inspection department men but under the above described circumstances each one carries with him only disconnected items of new information; often he is in error regarding real developments at the plants where he has worked. Such incorrect or partial information is often of more harm than help to his new employers.

It is seldom that the men in charge of development work change from one company to another. This is due partly to the fact that they are rather valuable men to their own companies and partly to the fact that competing companies seldom know who these men are.

Conflicting Problems Are Presented

Such a situation has led to enormous wastes. Consider only the attempts which would be made by a producer skilled in zinc-base die castings to produce aluminum-base alloys. He immediately finds there is a large chasm existing between successful practices in the two classes. He must know what aluminum alloys tarnish least, what alloys are the most ductile, what alloys polish best, what alloys machine best; what impurities in the alloy cause poor finish on castings, what impurities cause shrinkage cracks, what impurities cause brittleness, what additions can be made to overcome some of these difficulties; what die steels are best, how should they be heat treated for small pieces, for large pieces, for slides or for cores; what materials should be used for small cores, for ejector pins, and how should they be heat treated; what materials are best for pots, goosenecks, nozzles, and where can they be obtained; what temperatures are harmful and what are best for each alloy.

To pressure die cast aluminum-base alloys requires an entirely different type of casting machine to handle the molten metal. In this field the developments outlined in the first part of this article have occurred within the past few years. Each company attacks this problem in its own way and gains some knowledge by "the experience of hard knocks." Each of the new machines developed represents some improvement over the old yet each has its disadvantages and there is still room for a considerable improvement. Good features in one machine are lacking in another. Were it not for the policy of secrecy in the industry it would be but a short time until the good and bad features of each machine would become known and a composite design would be evolved which would largely include the good and eliminate the bad to the great profit of the whole industry.

For years the United States has led the world in pressure die casting. Recently, however, more and more interest is being shown in Europe; in England this has resulted in the formation of the Die Casting Alloys Research Committee of the British Non-Ferrous Metals Research Association. Considerable research and experimental work has already been carried out and reported by this committee. More is in process, and a large program of future work is planned. This work is being financed by various die casting companies in that country and is going to mean rapid advancement for them individually and collectively. Although we in the United States may not have to fear that England will surpass us in tonnage of annual production of pressure die castings, we should begin looking to our laurels regarding our supremacy of knowledge in the art, technique of pressure die casting, and quality of product.

The only comparable activity on this side of the ocean is the work of a committee of the American Society for Testing Materials which is studying the physical properties of various alloys when pressure die cast into test pieces. This activity is supported by representatives of the leading factors in the industry, and by consumers of large quantities of castings. The writer ventures the hope that this is merely the first breach in the walls of secrecy, and is the forerunner of an association to promote an interchange of ideas and to conduct research and development work.

Many Developments in Non-Ferrous Metallurgy

New Avenues of Consumption for Copper, Nickel, Aluminum and Magnesium—Silver Solders to the Fore

BY W. M. CORSE*

A SURVEY of the non-ferrous metal industry shows a generally satisfactory progress for 1928, with a greater than usual advance in some branches of the industry. The chief features are discussed as follows:

Copper—*New Uses and Greater Consumption*

COPPER in particular showed a decided improvement in condition and 1928 saw the copper industry stabilized for the first time since 1921 when it was in a very difficult position with extremely large stocks above ground, with markets closed to it that formerly used large quantities of metal, and substitutes in use everywhere. The industry was in fact ten years in advance of peace time needs as far as opening up of mines and productive capacity was concerned.

Figures at hand show that through educational efforts, advertising and sales development work the reserve supplies of refined copper were reduced to 45,648 tons at the end of October, 1928. This is a new low figure and a most significant one in view of the fact that only seven years ago there was more than 300,000 tons of refined copper in reserve, and about one and one-half billion pounds above ground in all forms.

There is no question that there is an ever mounting yearly consumption of copper both in old uses and in new ones. Recent investigations show that the oil heating industry consumes 5,000,000 lb. of copper per year and by the end of 1928 the automobile industry will have consumed 228,000,000 lb. In the construction of practically impenetrable vaults 50,000,000 lb. is used annually, and the radio industry uses approximately 30,000,000 lb. Increased tonnages in the latter are expected in view of television and other electrical developments. The refrigeration industry has used 35,000,000 lb. and the electrification of railroads will absorb tremendous tonnages as it requires 55,000,000 lb. of copper for 1300 miles of track. In building and construction fields an increasing amount of copper and its alloys is being used. Statistics show that the consumption in 1926 was 68 per cent greater than 1922, and the use of brass pipe alone increased 400 per cent between 1921 and 1926.

New needs are always arising and new alloys are being perfected to replace old ones. In this latter class are Everdur and Tempaloy, both comparatively recent developments, the first of the Du Pont company and the American Brass Co., and the second of the Union Carbide & Carbon Research Laboratories, Inc. and the American Brass Co.

Nickel—*New Uses and Consumption Expanding*

WORLD'S consumption of nickel was greater in 1928 than in any previous year except possibly the war years 1916 and 1917. Different industrial applications of the metal have all shared in this demand, and nickel cast iron and the magnetic iron nickel alloys have contributed substantially to the increased consumption.

Nickel cast iron has continued to gain favor with both producers and users. In the relatively brief time in which this material has been commercially available, it has received the consideration of a large number of industrial factors. The many claims for the superiority of alloy cast iron have apparently been supported by its performance in actual service throughout the various branches of industry and machinery manufacturers, automotive engineers and others are specifying it more and more.

The actual consumption of nickel by cast iron foundries will probably show an increase this year of more than 100 per cent over 1927, and the increase in the number of foundries producing the material is approximately proportional to its tonnage increase.

The International Nickel Co. reports further that there has been a steadily increasing demand for electrolytic nickel and at the present time the production and use of this form of nickel is two or three times as great as it has been in the past. In consequence the production facilities for this metal have been increased at the Port Colborne Works of the International Nickel Co. in Ontario.

Electrolytic nickel containing 99.95 per cent nickel (plus cobalt) is being sold in either full size cathodes 27½ x 37 x ½ in., weighing 125 lb., or in the form of cut cathodes of various sizes including electro. squares either 1 in., 2 in. or 4 in. It is expected that the use and production of this exceptionally pure form of nickel will continue to increase in the future.

There has been a pronounced increase in the industrial use of nickel plating during the year. This is partly due to the increased popularity of high-quality nickel plating

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produced in plating plants organized for good technical control, and also to the favor which chromium flash plate over nickel plate has found with the public, particularly for automobile radiators and trim.

There has been a substantial development of nickel anodes from which it is quite clear that the trend is definitely in the direction of the use of a high purity nickel anode; viz., one containing not less than 99 per cent nickel. A recent interesting development along this line is the so-called depolarized anode, a rolled anode consisting of oxidized nickel, practically carbon-free. These anodes corrode much more evenly and cleanly than the ordinary cast or rolled anodes hitherto known.

Consumption of malleable nickel in the dairy industry has increased by 200 to 300 per cent in the past year, and it was utilized principally for pasteurizers, truck tanks and in heat interchanger apparatus in which seamless nickel tubing is employed. Another alloy containing about 8 per cent nickel, 18 per cent chromium and the balance iron is being tried out in the dairy field.

One of the newer and most useful applications of nickel is for caustic evaporator tubing and liners where it is replacing steel which is not sufficiently corrosion resistant to give long service.

Monel metal finds an ever-increasing use, and its consumption at present is at the high point of its history. This alloy is being utilized in the food manufacturing and serving industries by packers, hotels and restaurants, as well as in the electrical industry, where it is being employed in increasing quantities for structural purposes in connection with switchboard and line equipment, chiefly bolts and nuts.

Zinc—*Increased Use for Die Casting*

ONE of the interesting developments during the year in the zinc industry was the large increase in the use of high-grade zinc for die castings. During 1927 approximately 15,000 tons was used for this purpose, and the tonnage increased to approximately 25,000 tons in 1928.

Consumption of zinc in slab and wrought form has been about as follows: 48 per cent for galvanizing; 27.5 per cent for brass, and other copper nickel alloys; 12.5 per cent for rolling; and 12 per cent for miscellaneous purposes.

The retort method still carries on in the old manner. Certain changes in the metallurgical practice have been made at several plants which have resulted in marked economies. A Waelz process plant for fire concentration of low-grade zinc material (spelter furnace residues) in a rotating furnace was completed at the Donora plant of the American Steel & Wire Co. last summer.

In the electrolytic field, the new plant of the Bunker Hill & Sullivan Mining Co., at Kellogg, Idaho, commenced operation in October, with a designed production of 50 net tons per day. It is claimed that this plant will regularly produce metal analyzing 99.99 per cent Zn. The Anaconda Copper Co. completed its electrolytic plant at Anaconda, Mont., the latter part of January, the daily production being increased thereby 165 net tons per day.

Lead—*Selective Flotation the Chief Development*

THE lead industry progresses along well established lines from year to year with no spectacular deviation from normal. Dr. G. W. Thompson of the National Lead Co. states that the important features of the lead industry during the past year were principally those affecting the supply, from both primary and secondary sources. There have been no revolutionary discoveries but rather a continued development toward better methods in which chemistry has played the major rôle.

The development of selective flotation was the outstanding feature of the industry during 1928, and resulted in an increase of 24 per cent of the total production or a matter of 440,000 tons. Selective flotation makes possible the utilization of the low-grade lead-zinc sulphide ores just as the richer deposits of galena are showing signs of depletion. The discovery of selective flotation is significant when one considers that discoveries of new lead deposits are fairly infrequent and the only new ore deposit of commercial proportions at present is the Buchans mine in Newfoundland.

The salient factor in flotation progress is the development of "addition agents." Xanthates were considered the best reagents a year ago, but thiocarbanilide is said to have greater selective action with less tendency to promote bulk flotations of all sulphides. The acid brine leaching processes may become important in the future.

The progress in the pyrometallurgical field has been along mechanical lines and improved equipment. The Newman mechanical scotch hearth furnaces have been installed in the Federal lead smelter at Alton, Ill., by the Phelps Dodge Corporation, Douglas, Ariz., and additions have been made to the new smelter of the National Lead Co. at Buenos Aires.

In the last year 250,000 tons of lead were salvaged from scrap and it is interesting to note that the Harris and Thompson process (caustic soda) is solving the problem of producing soft lead, antimonial lead and tin instead of the usual junk white metal produced in the ordinary secondary smelting operation. This is a distinct advance in view of the fact that pure metals such as soft lead, tin, etc., are usually easily marketable, and this is not always the case with the "junk metal."

Aluminum—*Strong Light Alloys Gain in Favor*

A STEADY and gratifying increase in the use of strong aluminum alloys in various fields of industrial activity developed in 1928.

The relatively new aircraft industry has made remarkable strides in the past year and will undoubtedly advance even more in 1929. All aircraft manufacturers are emphasizing safety in design as well as high performance and durability, and aluminum alloys offer to these craftsmen the best possible medium as they combine high strength, resistance to corrosion, and a large factor of safety combined with non-inflammability.

Strong aluminum alloys are finding wider favor than ever in the older transportation fields, such as street railroads, railroads, etc., and commercial body manufacturers have taken advantage of the weight saving offered by aluminum construction to increase pay loads and reduce operating costs.

Aluminum furniture, a novelty not so long ago, is now well established, and a complete line of office chairs is available. In addition, this furniture is made for use in restaurants, cafeterias, libraries, and dining cars. The New York Life Insurance Co. has installed 3500 alu-

minum chairs, and aluminum dining chairs are becoming standard on the Pennsylvania and Southern Pacific Railroads.

The long existing uses and the minor products such as aluminum bronze powder (a paint pigment), screw machine parts, bottle caps, foil and collapsible tubes all show normal consumption increase.

The products used in the building trades, such as aluminum shingles, nails, roofing and guttering, also show a normal increase.

Magnesium—*Consumption Has Doubled*

SUCCESSFUL heat treatment of magnesium-base alloy castings and the forging of magnesium are the outstanding achievements of last year. Consumption doubled over that of 1927, though it is referred to in pounds rather than tons, and this increase in the demand for aluminum base alloys containing magnesium accounts for the increased consumption. Quantity production and process technique are essential, however, to lower costs.

Magnesium is one-third lighter than aluminum, but as yet it cannot compete in worked forms with the mechanical properties of the aluminum heat-treated alloys. However, continued research bids fair to overcome the fabrication handicaps, and the peculiar properties of this metal will be made available, especially in those fields where weight saving is a factor.

During the year there has been placed on the market a new aluminum alloy known as Hyb-Lum. The alloying elements are nickel and the chromium group metals, rather than the usual copper, manganese, silicon and magnesium, and the total addition of all heavy metals to the formula, is approximately 2 per cent.

Hyb-Lum is pure white, lacking the grayish blue of cast aluminum. It takes a brilliant polish and its non-tarnishing qualities are claimed to have been proved by exposing a sheet to all kinds of gases and often a large excess of moisture in a chemical laboratory. It is claimed that the alloy is only slightly affected by salt spray and cyclic immersion tests for intercrystalline corrosion. It is said to be more chemically resistant than pure aluminum, that it welds with gas as well as pure aluminum and is superior to pure aluminum and other high-strength alloys in arc welding.

Silver Solders—*Displacing Older Types*

THIS would seem to be an opportune time to call attention to the silver solders that have shown a considerable increase in use during the past few years. One prominent manufacturer of silver solders has done a large amount of research work on various compositions, obtaining thereby fundamental data upon which to base selection of the composition best suited for any particular purpose.

Some interesting developments have been observed in joining stainless steel and iron while, through the cooperation of the larger producers of non-ferrous metals and alloys, much progress has been made. In the industrial field the largest consumers are the automobile and airplane industries for the present, but the silver solders are being introduced successfully in many other lines in connection with Monel metal, nickel, nickel silver, brass, bronze, copper, iron and steel.

The silver solders have supplanted the spelter or brazing solders where the lower melting range of the former prevents the damage that might be caused by overheating. They have taken the place of soft solders in many instances because joints made with silver solder give high tensile strength and resist shock and vibration, while their non-corrosive properties are an important consideration for using them in those places where corrosion is a factor.

Bearing Bronzes—*Valuable Results from Research*

WEAR testing of non-ferrous alloys, and especially the bearing bronzes, has always been a difficult problem. An important step toward its solution has been made by the Bureau of Standards, and the first published report of the work done in the metallurgical department of the Bureau—work which has extended over a period of years—was published in booklet form last year under the title of "The Wear and Mechanical Properties of Railroad Bearing Bronzes at Different Temperatures." This was a cooperative research work in which the Bureau of Standards and the Magnus Co. of Chicago participated.

At present the Bunting Brass & Bronze Co., of Toledo, Ohio, is cooperating with the Bureau of Standards along similar lines in an investigation of the same type of wear on automobile bearing bronzes. As the tests have not as yet been completed, the reports have not been published.

The Buffalo Bronze Die Cast Corporation of Buffalo, N. Y., is now marketing, under the trade-marked name "Durbar," a high-lead bearing bronze containing between 20 to 30 per cent of lead, depending on the grade desired.

This should prove a distinct advantage in the bearing field, where it has long been recognized that bronzes with a high-lead content are superior metal for certain bearing purposes. Commercial production of such bearings has been rare, however, because few foundries have been able to cast copper and lead in combination without segregation of the metals and produce at the same time castings uniformly free from porosity and hard surfaces.

Aluminum Bronze—*Distinct Improvements Achieved*

THE most outstanding development reported in the aluminum bronze industry during the year was the production of castings to withstand pressures in the neighborhood of 3000 to 5000 lb. per sq. in. This was reported by the Hills-McCanna Co. of Chicago.

Research work on this material in the form of corrosion fatigue tests is being conducted at the Naval Experiment Station under the direction of Dr. D. J. McAdam, Jr. Certain of these tests show that some of the aluminum bronzes have the highest endurance limits of all of the non-ferrous alloys, and are second only to the stainless steels.

Alcumite, produced by the Duriron Co., Dayton, Ohio, and the Hills-McCanna No. 45, produced by the Hills-McCanna Co. of Chicago, were especially mentioned in this connection.

Management and Markets

AMONG today's industrial management problems those of marketing and forecasting are getting attention in a widening circle. Accordingly, in an issue devoted to performance and progress, it has seemed fitting to group in the immediately succeeding pages the experience and observations of those qualified to discuss the questions.

Included also are that new suggestion that business may exercise group action under its own regulation and such absorbing matters as the meeting of new and larger mergers in competition, the use of water transportation in the scheme of distribution or in tapping new markets, the labor question as relates to stability of employment and the growing need, again recognized, of training foremen.

The topics covered in the following pages include:

Sales Studies

* * *

Mergers

* * *

Position of Small Companies

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Self-Regulation

* * *

Use of Waterways

* * *

Stability of Employment and Training Foremen

Self-Government in Business

Opinion Divided on Advantages of Trade Practice Conferences Under Federal Commission's Auspices—Commission's Powers Questioned

MARKED changes in economic conditions have beset the path of industry since the World War. Much has been heard of the "new competition," "profitless prosperity," the "new industrial revolution," overproduction and other phases of problems for which solutions are now being sought.

Broadly the new competition refers to the arraying of industry against industry in the struggle for markets. A new industrial revolution is seen in the ever-increasing efficiency growing out of mechanization and mass production and the apparently inevitable creation of excessive capacity, with output expanding more rapidly than consumption. Small margins of profit or lack of profit, despite great industrial activity, have given rise to complaints of profitless prosperity. Each factor is related directly to the other.

The lure of lower costs with sustained heavy output has led to excessive pressure for business volume. As marketing has become more uneconomic and extravagant, industry has grown apprehensive of the possible consequences and has sought a remedy. Some manufacturers have protested against Government restraints and have urged that the anti-trust laws be modified and adjusted to modern business conditions. Even those who admit that trade agreements, under existing laws, can prove effective means of protecting industry and conserving products for the best interests of the public, contend that there are obsolete features and unsound provisions in the anti-trust statutes that should be removed in the interests of greater freedom in business.

At the same time there is a deep-seated feeling in industry that to turn to the Government for relief is to invite increased bureaucracy. As a result greater emphasis has been given to what is called self-government in business. Trade association activities have expanded, and common problems of industry have been discussed more freely. More intelligent coordination of effort and greater cooperation have been brought about.

Government Asked to Enforce Industry's Self-Imposed Rules

Yet, curiously enough, the movement in the direction of self control, in some instances, has led to appeals for Government assistance. In establishing trade practices as the basis for self-government in given industries the Federal Trade Commission has been frequently called upon to act as the intermediary. Already more than 300 rules have been adopted by industries in trade practice conferences in which the commission has participated. Many manufacturers who have taken part see enduring benefit from the regulations drawn up and believe their effectiveness is insured by the enforcing power of the commission. They contend that the practicability of the conferences is proved by the fact that power of the Federal body to enforce rules has been invoked in less than a dozen cases. The establishment of trade practices in this manner, it is urged, raises the level of business ethics, wipes out unfair methods of competition, effects market stability and makes for a better spirit among competitors.

Business men are by no means unanimous in accepting the claims of benefits to be derived from the trade practice conference. Extreme critics charge that the self-regulation movement actually aims to circumvent the anti-trust laws and establish control of prices. It may be said definitely, however, that this is the view of a small minority, although including a number of astute students of trends in modern industry.

A larger group looks askance at trade practice conferences mainly because they represent a further intrusion of Government into business. Even this class is divided among those who condemn the conference plan entirely and those who see benefits from it, if restricted in its scope.

Among organizations that have given close study to the plan is the National Association of Manufacturers, which takes the position that the trade practice conference, insofar as it is limited to obtaining the view of an industry as to what it considers unfair methods of competition, is a good thing. So limited, it serves to guide the Federal Trade Commission in interpreting its own statutory power. For, after all, it is pointed out, the jurisdiction of the commission extends to the prevention of unfair competitive practices. It cannot, however, be extended to cover practices which, while they may be condemned by the commission as uneconomic and unethical, do not meet the legal definition of unfair methods of competition.

The conferences establish two groups of rules or resolutions. The first group includes those approved by the commission *affirmatively*—meaning that violators may be named as respondents in formal complaint. The second group condemns practices regarding whose legality the commission expresses no opinion, but which it accepts as unfair methods of competition as interpreted by the trade. This latter group takes in a wide range, dealing with practices whose illegality is not established, as well as those considered unethical.

Trade Commission's Policy Challenged

"The theory on which the commission is now seeking to enforce Group 2 resolutions is not that the practices included in Group 2 are unfair methods of competition, but that the breach of contract to adhere to this group is in and of itself an unfair method of competition," said John C. Gall, associate counsel of the National Association of Manufacturers.

"From the legal standpoint it is submitted that the commission has no statutory jurisdiction to enforce private contracts, unless the breach of a contract in a particular case, because of the nature of the breach, does amount to unfair competition and is closely related to interstate commerce the commission has no jurisdiction to issue an order against a continued breach.

"I have touched only on the strictly legal aspect of enforcing Group 2 resolutions. It is unnecessary to emphasize what Commissioner William E. Humphrey has so clearly pointed out as to the practical difficulty of applying the 'clandestine violation' rule."

The officially announced policy of the majority of the commission with reference to the enforceability of Group 2 rules is as follows:

It is a matter of public importance that the question of the enforceability of Group 2 rules be judicially determined. To expedite such determination the commission has taken the position that the clandestine violation of any Group 2 resolutions by one who has subscribed thereto in consideration of the like subscription by others in the industry is in and of itself an unfair method of competition, calling for action by the commission, even though the practice condemned by such rule has not heretofore been held violative of the act by the commission or any court.

Commissioners Humphrey and Garland S. Ferguson, Jr., dissented. They contend that such enforcement is beyond the power of the commission.

Uncertain Status of Group 2 Rules Discourages Trade Conferences

"Now as to the policy phases of the matter," said Mr. Gall, "I think it must be clear that so long as there is a considerable doubt as to the status of Group 2 resolutions and their enforceability there must be a natural tendency on the part of business men to refrain from going into trade practice conferences and attaching their signatures to what the commission now interprets as a legally binding contract. Indeed, this suggestion is not fanciful, for I am personally acquainted with a number of attorneys who have caused their clients to remain out of pending trade practice conferences.

"In view of this fact, how can it be argued that the new attitude of the commission will promote real self-regulation in industry? Will it not, on the contrary, tend to undo the work formerly accomplished by the trade practice conferences, when they were directed to a consideration of matters clearly within the commission's jurisdiction? Is it to be said that the commission finds so relatively few instances of unfair methods of competion that it must now, in order to justify its existence, extend its jurisdiction to matters heretofore depending for their enforcement upon the good taste and conscience of American business men? If so, it is indeed a recognition of their inherent honesty."

The setting up of machinery for trade practice conferences is held by some critics to be an attempt on the part of the commission to extend its jurisdiction. Industry would do better, they maintain, to regulate itself within itself. That this can be done is not doubted by this group. They explain that a good example to follow as to such a particular policy is the American Federation of Labor, which has well-fixed rules whose violation is either prevented entirely or reduced to a minimum by the exaction of penalties.

Trade Practice Conferences Not Comparable with Cartels

The trade practice conferences necessarily have nothing to do with price agreements or anything relating to prices. Moreover, the history of the price agreements, pools, etc., of former days is so fresh in the memory of business men. Violations of such agreements became commonplace and for this reason alone, to say nothing of other practical considerations, there is no strong desire to adopt such a policy.

The fact remains, however, that price agreements abroad are common, and they are being studied for their effect on American business. The most notable are the numerous cartels that have sprung up since the World War. Before the war these cartels were confined largely to individual countries. Today they have taken on an international character. They do not limit themselves to price agreements, but also allot foreign business, production, quotas, etc. It may be said that the view in Government circles where these cartels have been studied is that they have not injured American business. Rather the effect has been in the other direction, because the cartels largely were established to eliminate cut-throat competition in foreign markets and to fix prices on a paying and higher basis, thus giving greater stability to the markets.

One of the results of the European international cartels may conceivably prove beneficial to the United States, according to Dr. Julius Klein, director of the bureau of foreign commerce, Department of Commerce. That is the stabilizing of "world market prices" for the commodities involved. Dr. Klein explained that the cartel's aim is to bring prices to a satisfactory level and to keep them there. Under such circumstances, the American exporter may, in certain lines, be able to compete more readily in the foreign field.

"In general," he said, "we have good reason to be keenly interested in the development of these cartels. But there is no reason for us to get panicky about them. Since they represent a powerful movement for winning, organizing and retaining markets—since they form a competitive instrument of impressive caliber in relation to interests outside themselves—it is not unnatural that they should excite rather acute anxiety, in many cases, on the part of the affected industries in this country. There is no doubt that their operations should be closely studied and immediately reported by competent observers, so that our industrial interests may be safeguarded to the fullest possible extent."

While Dr. Klein did not say so, the kind of observation of which he speaks has shown that price and other agreements among these cartels have been violated, frequently with apparent impunity.

Cartels Born of Savage Competitive Conditions

Dr. Klein stated that the cartels are of vital interest, if for no other reason than the fact that American industries open to direct competition from European cartels have an annual output valued at more than $5,000,000,000. Pointing out that the international cartels concern themselves with such matters as control of prices, market territories, sales terms, credit policies, standardization, interchange of patents among members, etc., Dr. Klein said they were organized primarily as a remedy for economic confusion, "the savage competition and the trade barriers that came as inevitable aftermaths of the World War. The forces that brought these about were many—the disruption of empires, the transfers of territory, the new and lowering trade barriers, the currency inflation, the overproduction of goods resulting from the artificial wartime stimulus."

The raw steel combination was mentioned as one of the most notable international cartels, while others referred to were those covering rails, tubes, aluminum and copper.

"The steel cartel," said Dr. Klein, "includes the steel-producing interests of Germany, France, Belgium, Luxemburg, the Saar, Czechoslovakia, Austria and Hungary. So far, this steel entente hasn't tried to fix prices. But it has controlled production, to a marked degree at least, by establishing quotas for various member countries. It has imposed fines on its members for overproduction and has granted compensation for underproduction."

Cartels May Encourage Buyers to Combine

From the standpoint of the producers, Dr. Klein said, the international cartel has given some promise of more stabilized trade conditions. But as the movement succeeds in this aspect, it was pointed out, other elements in the economic picture clearly become involved. Unless the producer groups make some attempt, it was declared, to consult and win the friendly support of consumers, it is quite obvious that the consumers may resort to some corresponding protective device. This, Dr. Klein asserted, may take the form of buyers' combinations.

British industry so far has participated in few of the cartels, due partly, in the opinion of Dr. Klein, to the fact

that British producers in any given line are, in general, not closely organized in any really effective unit. The successful functioning of an international cartel presupposes the existence, within the various member countries, of cartels or similar bodies capable of insuring the fulfillment of the conditions agreed upon internationally. This was given as the reason why Germany plays such a big part in the international cartel movement. It was described as the "classic" example of a country organized industrially on a basis of cartels, of which it has 3000, all but 500 being industrial.

Because of the favorable attitude of the German Government and the liberal interpretation of the term "monopoly" from a legal standpoint, the degree of amalgamation in German cartels has, on the whole, become much closer than before the war. There is very little room for price competition in the domestic German market. In certain cases the government of the German Reich or Prussia participates directly in an important cartel. Such conditions and practices obviously would be contrary to law in the United States.

Herbert Hoover Favors Self-Government in Business

It also would be far afield from self-government in business. The latter subject gathers increasing interest and importance since Herbert Hoover takes office on March 4 as President of the United States. No one has protested against Government in business more than Mr. Hoover. Repeatedly he has inveighed against it. Some of his pithy observations on the subject have almost become classic. He wants business to regulate itself.

"Self-government consists of government outside of the law, not inside of it," he declared on one occasion.

There is a great deal of speculation as to what Mr. Hoover may or may not do in the direction of separating Government and business and reducing certain kinds of activities while increasing other kinds, the latter looking to closer cooperation of a desirable kind between Government and business. Mr. Hoover has said that where associations, such as chambers of commerce, trade associations, professional associations, labor unions, trade councils, farm associations, etc., undertake high public purposes he wishes to see active cooperation by the Government with them. Without intrusion, he said, the Government can serve to bring together discordant elements and to secure cooperation between different industries and groups. It gives, he pointed out, great hope for a new basis of solution for many problems and progressive action.

"It should be the response of Government to our new economic conceptions," President-elect Hoover said. "It is consonant with the American system. It is a method that reinforces our individualism by reducing, and not increasing, Government interference in business and the life of our citizens.

"Such cooperation strengthens the whole foundation of self-government and serves to maintain equality of opportunity and constructive leadership.

"This cooperation can take two distinct directions. It can assist in the promotion of constructive projects of public interest, on one hand, and it can assist in the cure of abuses by voluntary establishment of a higher code of ethics and a stricter standard in the conduct of business."

Future Omens Propitious but Ideals Must Be Maintained

BY GEORGE M. VERITY*

THIS is generally admitted to be the industrial age, but I would describe the 10-year period, comprising the five years just passed and the five just ahead, as the economic era of the industrial age. The laws of economics have always existed, but we are in a period when they are finding more practical expression than ever before.

Today production must be maintained on a basis as to quality and quantity not only beyond the imagination of man a generation ago, but also at a cost per unit impossible to attain under old conditions. This situation exists in spite of the fact that in the production of basic products expensive research and development work must be carried on, to insure the progress in design and utility necessary for a continuation of mass consumption.

That economic laws are constantly taking their toll of business adventure is visualized by the weekly reports of business failures. This constant drain on our material and human resources shows clearly the penalty to be paid for willingly or unwillingly ignoring the fundamentals of economics or of failing to meet the irresistible demands of an ever changing world.

I doubt if we have ever faced a new year with so many encouraging factors outstanding and with apparently so little to fear. That fact of itself is good ground for caution. We seem to be facing a period in which we should enjoy the cumulative benefit of the economic and political readjustments of the past 10 years. We seem, in fact, to be on the threshold of a new era in American business.

Our national debt has been substantially reduced and our tax burdens lightened. Europe has made substantial economic recovery and our foreign trade is growing. Agriculture has improved, and this will favorably affect our whole business structure. Daniel Willard, president of the Baltimore & Ohio Railroad, recently stated that the railroads would buy more liberally in 1929, but would not reach normal in their purchases for two or three years.

The oil industry is in better condition. New construction work has attained a surprising total. The mechanization of agriculture and the improved mechanization of industry proceeds apace. The proposal of our President-elect that industry, the State and the Nation accumulate a gigantic reserve fund to carry on new construction work during times of slack business holds tremendous possibilities. The development of new forms of transportation and new means of communication moves steadily forward. Transportation through the air gives promise of creating an enormous industry within the next 10 years.

Indications are that the coming year will continue satisfactorily as to volume and consistency of demand from the standpoint of American industry, for conditions both national and international forecast such a trend. Our own country, on the whole, is enjoying the most soundly and uniformly prosperous period that has been the lot of any nation. However our future prosperity will be determined by our ability to hold and to improve further our new standards of living. But this improvement cannot come from material things alone. There must be a continued growth in cultural things, while ideals are also maintained—ideals characteristic of the moral and spiritual convictions of our forefathers. Without such ideals, there can be no permanent material gain.

There are those who constantly insist that we as a nation are becoming too materialistic, too absorbed in the mere making of money. With that thought I cannot fully agree. The lives and happiness of 120,000,000 people are bound up in America's material progress. Poverty cannot be extinguished and comfort and plenty for the masses assured unless business men devote themselves unreservedly to the successful conduct of business, the carrying on of which becomes a great public trust.

*President American Rolling Mill Co., Middletown, Ohio, whose remarks here printed are from an address before a meeting of Armco distributers.

"KNOW YOUR MARKETS"

Market Study a Fundamental Need, but Extent to Which It Can Be Used as Basis for Sales Forecasting and Budgetary Control Varies

KNOW your markets. These three words convey the most important message that can be given to American manufacturers today, in the opinion of Dr. H. S. Person, managing director of the Taylor Society, New York.

"Market analysis is not new," he said, when interviewed by an IRON AGE representative, "but it has been given increasing emphasis since the war because of the prevalence of a buyer's market. In ante-bellum days demand was commonly a step ahead of output and the accumulation of inventories caused no concern because the trend of prices was upward. Production problems consumed the attention of manufacturers, who relied on the natural growth of the country to provide the market for their goods. Great advances were made in the development of labor-saving equipment, and important steps were taken to obtain greater efficiency from the workmen themselves. The relation of the man to the machine was first brought to public attention by Frederick W. Taylor, who, through long and painstaking study of this subject, evolved what has come to be known as scientific management.

"Scientific management was given great impetus during the war when all efforts of industry were concentrated on increasing output. Production and more production were demanded, and results had to be achieved with a dilution of labor. Again in the post-war boom there was pressure for production.

"The severe business reaction that followed brought a radical change in the industrial situation. Inadequate productive capacity suddenly became excessive, manufacturers found themselves with large frozen inventories, a buyer's market replaced a seller's market. Economies obtainable from mass production lost their meaning because commensurate consumption had disappeared. Manufacturers faced the necessity of finding out definitely what they could expect to sell; they could not afford operating in the dark at the risk of further expanding their already swollen inventories.

"Market study was, therefore, a natural sequence. Some companies became so thorough and expert in analyzing their markets that they found it possible to make sales forecasts of remarkable accuracy. Forecasting has now become an established practice of many manufacturers and forms the keystone of a highly developed and unusually efficient plan of management."

"Do you regard sales forecasts as prerequisite to budgetary control?" Dr. Person and asked.

"Yes. Nothing could be more obvious. Probable sales must be measured before production can be planned and before the various elements of cost that must come out of the sales dollar can be apportioned."

"How long has sales forecasting been successfully practiced?"

"As a basis for close managerial control," he replied, "the sales forecast is relatively recent. Market analysis, however, has long been employed by some companies. Fully 20 years ago activities of this character by the New England branch of an electrical equipment manufacturer came under my observation. Close track was kept of all projected plant or utility construction that might require electrical equipment. As one means to that end a corps of young women in the Boston office carefully scanned newspapers and magazines and clipped items relating to new construction. Existing equipment in New England plants also was canvassed and catalogued. In addition to entering a description of such equipment and estimating its age, a hypothetical date was set down for it to pass out of service. In this way the company prepared itself for timely solicitation of replacement business."

"Do you believe that sales forecasts can be made for all types of business?"

"My answer is emphatically in the affirmative," answered Dr. Person. "Of course, more accurate forecasts can be made for some companies than for others. A manufacturer with nationwide trade has a marked advantage over one with a sectional business. Companies whose trade is influenced by conditions in a diversity of industries have a simpler problem than those serving a single, narrow field. The Walworth Co., Boston, which has one of the most successful forecasting systems, is able to make its market analyses largely from a study of statistics covering construction activity and data avail-

H. S. PERSON has long been identified with the study of management problems. Graduated from the University of Michigan in 1899, *he obtained degrees of Master of Arts and Doctor of Philosophy in the same institution in* 1901 *and* 1902. *From* 1908 *to* 1919 *he was professor and director of business organization and management of the Amos Tuck School of Administration and Finance, Dartmouth College, Hanover, N. H. During the war he was major of the Ordnance Reserve Corps and major in the Inspector General's Department. Since* 1919 *he has been managing director of the Taylor Society.*

able regarding general business and industrial conditions."

"Do you regard sales forecasting feasible for manufacturers doing business of a jobbing character?"

"The forecasting problem of companies in what might be called the engineering group, as distinguished from those making standard products, is particularly difficult. I refer to those who make products according to specifications. Even where satisfactory estimates can be made of the volume of business that will be booked, there is no way of planning definite production schedules in advance of the receipt of the specifications, and obviously budgetary control, as commonly understood, cannot be attempted.

"The steel fabricating plant cannot anticipate the kind of structural steel work that it will book. The jobbing foundry cannot foresee the character of the castings it will be called upon to make. Makers of certain types of conveying equipment must also wait for specifications. Even when engineering equipment is standard, it may require tying up so much working capital that no manufacturer would consider building it in advance of selling."

"Is the conclusion warranted that forecasting does not mean the same thing for all types of manufacturers?" Dr. Person was asked at this juncture.

"Most decidedly. It has always been hard to get business men to appreciate that scientific management is the application of principles and not of details. The enthusiasm for Taylor's accomplishments at the heyday of his career, before the war, gave rise to many imitators, who, self-styled as "efficiency engineers," unquestionably did a great deal of harm in American plants. It was demonstrated at that time that a system successful in one plant cannot be lifted bodily and transplanted in another plant. Such attempts were directly counter to Taylor's teachings, which always emphasized that scientific management is a method of approach, not a ready-made system to be applied universally. His cardinal principles were (1) research, (2) standards, (3) control. Research uncovers the facts, the establishment of standards replaces the unknown with the known, control implies revising operating methods to conform with the standards fixed.

"These basic principles apply with unimpaired force to the phase of the management problem that is receiving the most attention today. No matter how difficult market analysis may be in given industries, it will uncover facts of benefit to manufacturers. Some light is better than no light at all. If budgetary control is not possible, the sales forecast will at least permit a balancing of facilities. It will make it possible better to prepare for the business anticipated by arranging for necessary working capital, purchasing part or all of the raw materials required, remodeling or expanding plant, or providing improved equipment. It may make it advisable to produce a stock of such parts as are standard in the products made, but the resulting advantage in more stable plant operations must be carefully weighed against the undesirability of tying up capital in inventory.

"The problem of each manufacturer stands by itself. Obstacles to solution are being met and overcome. Even in industries where the dominant market factor is style, which happily is absent in a large part of the engineering field, sales forecasts are being successfully made.

"The correlation of production with consumption sought through market research is not attainable in equal degree by all manufacturers, but this fact does not reduce the need for and the benefits from knowing one's market."

Forecaster Points to Business Downswing After Spring Peak

Business activity will decline in 1929 if previous sequences are repeated, according to Alvan T. Simonds, president Simonds Saw & Steel Co., Fitchburg, Mass. Writing in *Looking Ahead* for Jan. 1, he points out that since 1919 there has been marked correlation between industrial production and the trend of money rates reversed.

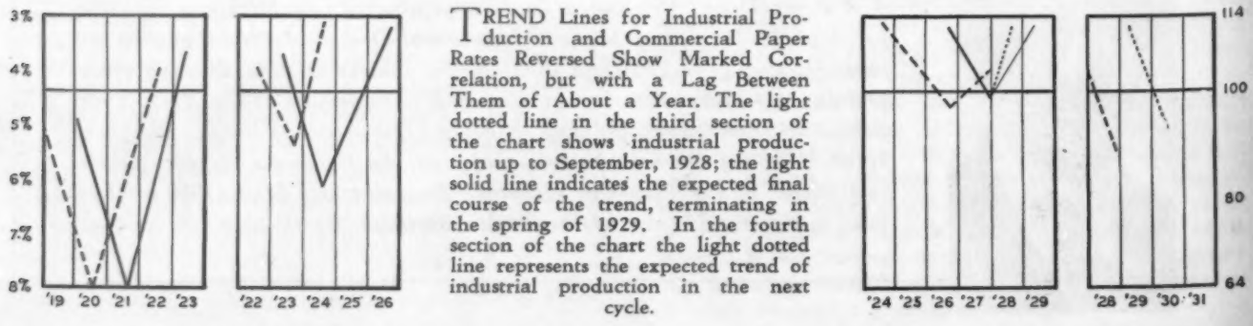
"The chart shows the cyclical movements of money rates and industrial production since the war. The first two cycles are complete. In them it is evident that industrial production moved down after a continued rise in money rates, and moved down for approximately the same length of time that money rates continued to rise. It is also evident that industrial production moved up after a continued fall in money rates and for approximately the same length of time as they continued to fall.

"On the chart the movement of money rates is reversed, for increasing money rates are followed by decreasing production, and decreasing money rates are followed by increasing production. Note that the trend of production does not change direction until a year or longer after a change in the direction of the trend of money rates. This chart is the long-time forecaster for the sales of the Simonds Saw & Steel Co. It is a forecaster also of general business and trade.

"The third cycle is almost complete. The light dotted line shows industrial production up to September, 1928. Later data is not at hand at the time of this writing. The light solid line indicates the final upward movement in the cycle of industrial production, as we believe it will be, i.e., up to a peak in the spring of 1929.

"The fourth cycle began January, 1928, with an upward trend in money rates, the sharpest change in direction since 1919 and 1920. From January, 1928, to October, 1928, commercial paper rates increased from 4 per cent to a trifle over 5½ per cent, a rise in the cost of commercial loans of 37½ per cent.

"The light dotted line in the fourth cycle shows the movement of industrial production and of general business as its direction will be, if the sequences shown in the first three cycles are repeated in the fourth; its length will depend upon how soon money rates begin to decline.



TREND Lines for Industrial Production and Commercial Paper Rates Reversed Show Marked Correlation, but with a Lag Between Them of About a Year. The light dotted line in the third section of the chart shows industrial production up to September, 1928; the light solid line indicates the expected final course of the trend, terminating in the spring of 1929. In the fourth section of the chart the light dotted line represents the expected trend of industrial production in the next cycle.

Smaller Companies Will Be Secure

The Proviso Is There Must Be Wise Management, with Budgetary Control, to Compete with the Continuing Mergers

BY ROBERT T. KENT

WHAT is the status of management to be in the year to come? A glance at industry in 1928 will reveal that management—the word is here used in its broad sense of the direction of an industry as a whole—is the one agency that will enable the smaller industry to survive and insure to the larger one a greater measure of profit.

The tendency of industry during the past few years has been toward consolidation. The aggregation of capital in merged or consolidated industries is a powerful tool of trade. It can and does dictate the prices at which it will buy. It can, and sometimes does, dictate the prices at which its smaller competitors may sell. Unrestrained by law or wise management, it may be a power for evil. Wisely managed, its influence on industry will be of the best. The history of these consolidations is too short to permit any prediction as to their final effect. Certain tendencies, however, may be pointed out.

ROBERT T. KENT

Director of Engineering and Sales of Divine Brothers Co., Utica, N. Y.

Every consolidation brings new problems in finance. The financing charges frequently create new and larger overhead expenses, which must be met by a wider spread between the raw material cost and the price of the final product. Two methods of increasing the spread are possible; lower prices for material and supplies, and increased economy of operation.

Lower material prices have been obtained too frequently by the use of the bludgeon. The purchasing agent has brutally played one vendor against another to hammer down prices, regardless of whether or not the vendor makes a profit. Such a short-sighted policy in the end defeats its own purpose, and results finally in much higher prices or a total inability to procure supplies. A continued campaign to reduce prices to a no-profit basis results in the gradual elimination of weaker vendors via the bankruptcy route. Those remaining become strong enough, either by the elimination of competitors, by consolidation, or by means of cooperative action through a trade association, to resist and to dictate prices and policies. When this occurs, those corporations that have had small regard for the vendor usually pay heavily for their brutal policies.

Industry in the not distant past has passed through all of the phases just noted. Happily, there is becoming evident a desire in the better-managed corporations to curb this tendency to exploit the vendor. Wise management realizes that to have a permanent source of supply, the vendor must make a profit. Cooperation between buyer and seller, particularly in the engineering industries, to reduce the seller's manufacturing costs, is becoming more frequent. It is not unusual for a large buyer to fix the price which he can afford to pay, but he then has his engineers assist the seller to improve his methods, to the end that goods may be sold at a profit at the price fixed. Contrariwise, the seller is not infrequently called in to point out economies in the use of his product, that will enable the buyer to pay the price asked, and yet not increase his final costs. The extension of this policy of mutual help is clearly forecast and will be of incalculable benefit.

On the second phase of increasing the spread, increased economy of operation, little need be said. It was in this field that management first took its stand, and what is done in the future will merely be building upon the foundations laid in the past.

Efforts in the past have centered on increasing the efficiency of the individual workman. At present, and for the future, the trend seems to be toward increasing the efficiency of the machine. While organized labor has betrayed a slight uneasiness over the substitution of automatic machinery for man power, it is unlikely that it will take a positive stand in opposition to this trend. It is definitely pledged to a policy of cooperation with management to reduce costs and eliminate waste. It is probable that the improvement in methods will continue unchecked along the lines indicated for a long time to come.

The relatively narrow spread that exists in present day industry demands that management keep itself informed at all times of the costs in every department of its business. Costs form the most powerful tool of management, and their intelligent use is becoming daily more important.

Not so long ago costs were merely a financial history, more or less interesting, and comparatively little used. Now, predetermined costs, in budget form, set alongside of actual costs, enable management to examine minutely every detail of the business, and to act swiftly and surely whenever action is indicated. Budget control of industry is comparatively new. Its development has been rapid. Its use will be absolutely necessary in an industry that is to survive.

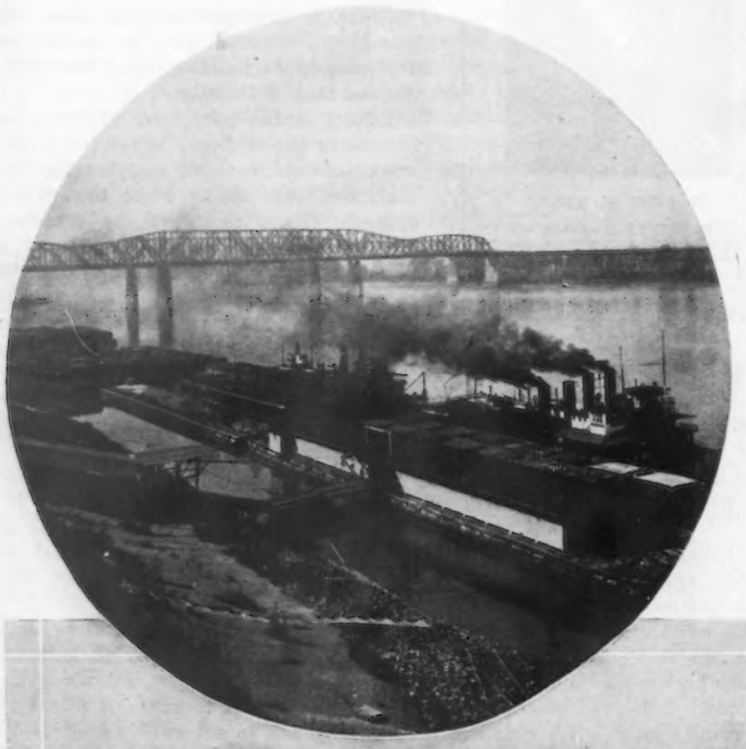
The owners of small industries have been fearful of the effect of consolidations upon their future. With wise management, careful purchasing, budget control, a close study of equipment, methods and costs and with cooperation with its competitors through trade associations, the small industry has nothing to fear. The large corporation, due to its resources, can effect economies that are beyond the reach of the small concern. On the other hand, the large corporation has overhead charges that impose a burden on it that the small one avoids. The disadvantages offset the advantages, and the small corporation, with good management, can compete with the large one on equal terms. But wise management of the smaller units is imperative.

Water Shipments of Pig Iron

DEVELOPMENT and use of the nation's inland waterways in the past year made definite progress toward the realization of the ideas of those who long have labored in the cause of increased employment of rivers and lakes for the transportation of freight.

Canalization of the Ohio River from its source to its junction with the Mississippi at Cairo, Ill., is within a few months of completion. With this accomplishment, a 9-ft. stage of water the year round is assured.

The work of making the Illinois River navigable from the Chicago drainage canal to the Mississippi has made enough progress in the past year to warrant the assertion by the Army engineers that the work will be completed by March, 1931. In a similar period, the Missouri River will have been improved to permit all the year round navigation from St. Louis to Kansas City. A fair trial was not afforded in 1927 of the usefulness of the upper Mississippi from St. Louis to St. Paul and Minneapolis as a means of supplementing rail service and lowering transportation costs, because the barge line service established by the Inland Waterways Corporation (Federal Barge Line) did not begin to function until only a few months before the navigation season ended. The showing of 1928 will be more favorable because of a full season, but those interested in this branch of the inland waterways system see that its real usefulness can never be attained so long as its stage of water remains less than that in the Ohio River and the lower Mississippi. Indeed, at river improvement conventions one plea has stood out,



BUSY scene at one of the municipal river and rail terminals at Memphis, which is a center for redistribution of steel shipments received by water from Pittsburgh district mills (at left).

Terminal basin at Gowanus Bay, New York City, crowded with craft for transport through the New York State Barge Canal, on which a great deal of pig iron has moved in the past year (below).

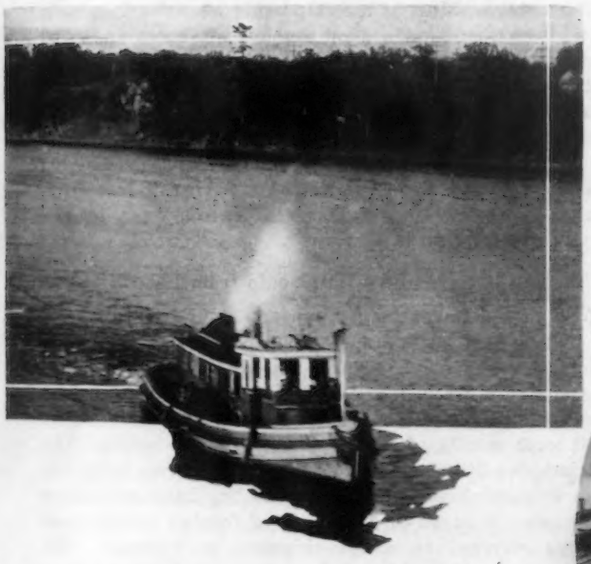
and Steel Greatly Increased

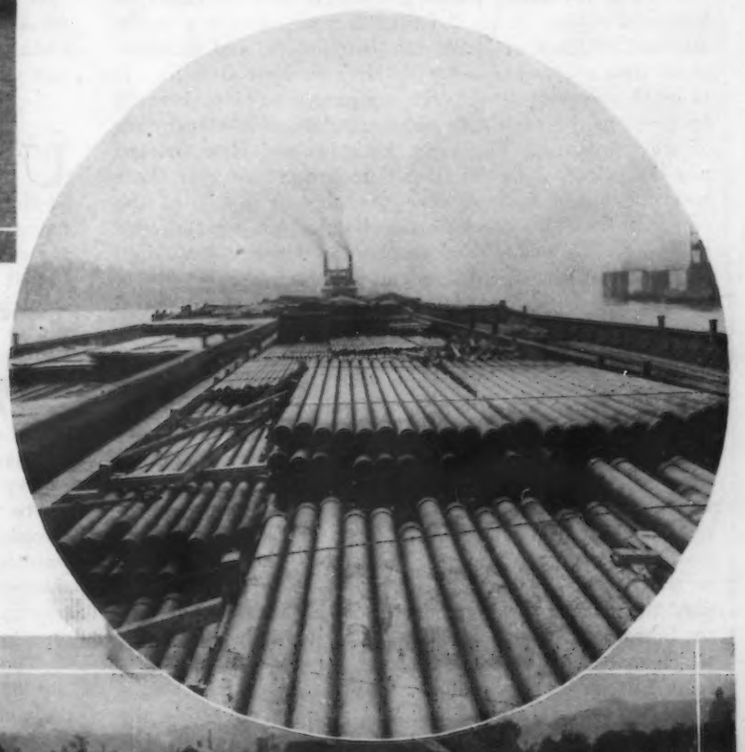
and that is that all rivers should have the same minimum water stage, standardization of locks and dams is a related demand.

River shipments of steel from the Pittsburgh district have been made in elapsed time substantially equal to that of the railroads for an equal distance. For instance, the Jones & Laughlin Steel Corporation made a delivery at Memphis, Tenn., a distance of 1200 miles in 1926 in 152 hours. But water stage conditions were exceptionally favorable and a number of delays for going through locks were obviated by a sufficient depth of water. Essentially, river shipments of steel are not made with an idea of equalling the railroads in speed, but rather of placing, at strategic points, stocks of steel that may be moved at shorter notice and more promptly from warehouses than from the mills. Putting a stock of pipe at Memphis, for example, means that when a sudden demand comes from the Southwest for quick delivery part of the requirements can be immediately supplied, and in these days of close range buying promptness of delivery counts heavily in the getting of orders.

Movement of Iron and Steel from Pittsburgh Mills by Water Increases

TOTAL tonnage of iron and steel and their manufactures handled on the Allegheny, Monongahela and Ohio Rivers, within the jurisdiction of the Pittsburgh office of the United States Corps of Engineers, for the 11 months ended Nov. 30, last, was 2,262,126 tons, the





A BARGE shipment of pipe on its way from Pittsburgh down the Ohio River (at right). First barge shipment of steel products from Pittsburgh to the Northwest, leaving Aliquippa works of Jones & Laughlin Steel Corporation. The arrival of this barge at Minneapolis was the occasion for a civic celebration (below).

Allegheny showing 8303 tons, the Monongahela 1,091,380 tons, and the Ohio as far south as Wellsburg, W. Va., 1,162,445 tons. In the same period in 1927, the total was 1,264,922 tons. The figures, however, are for inward and outward movements and include a good deal of interplant shipments, as well as deliveries by Pittsburgh district mills to customers whose plants are on water routes within the district. The Steel Corporation uses the rivers freely in moving shipments from one plant to another, and the Jones & Laughlin Steel Corporation is operating a car ferry for interplant movements between its Pittsburgh and Aliquippa works. The Pittsburgh Steel Co. also finds the Monongahela useful in taking crude steel from Monessen to its pipe plant a short distance away at Allenport, Pa.

Four Mills Send 300,000 Tons South by Water

THE vital statistics of river-borne steel shipments are those pertaining to deliveries well outside the Pittsburgh district. The most common users of the rivers are the Carnegie Steel Co., which handles its own products and those of the associated subsidiaries of the Steel Corporation; the Jones & Laughlin Steel Corporation, the Pittsburgh Steel Co. and Spang, Chalfant & Co., Inc. The last named made its first river shipment last May to Memphis, where it has storage facilities. The others have been using the rivers for many years in getting their products to Southern points. Jones & Laughlin made one tow a month during 1928, just as it did the year before, and Carnegie made nine shipments south by river to New Orleans. It is estimated that these four companies have sent south by river in the past year approximately 300,000 net tons of steel products. St. Louis, Memphis and New Orleans are the principal destinations, but during the year there was one barge load of wire products in a tow of the Jones & Laughlin Steel Corporation, which was dropped at Cairo, Ill., and picked up by the Upper Mississippi River Barge Line for delivery at Minneapolis.

The Wheeling Steel Corporation also was a liberal user of the Ohio River in moving its various products, notably pipe, to its warehouse at Memphis. The Weirton Steel Co. completed during the year its loading dock and is likely shortly to begin using this river for shipments of steel products. The Bethlehem Steel Co. has made trial shipments from its Cambria works, Johnstown, Pa., shipping by rail to Glassport, Pa., on the Monongahela River, where the steel has been transferred to barges for movement south. This company is said to be investigating the possibilities of an all-water movement from Johnstown to the South. To make this possible, it would be necessary to improve the Connemaugh River, which runs close to Johnstown, to its junction with Kiskiminetas River, which empties into the Allegheny River not many miles from Pittsburgh.

Now that the Ohio River will soon be navigable the year around from its source to its junction with the Mississippi, steel men in Pittsburgh are hopeful that the vast expenditure which this accomplishment has meant, will not be allowed to go to waste. And the most effective means of preventing that will be an application of railroad methods of operation. Telephone connection between locks to enable one keeper to call on the keeper of the lock above to release a flow of water at short notice is one essential, as there are bound to be periods when the water will be too low in some stretches of the river to float the cargoes.

The United States Engineer's office at Nashville reports that in the 10 months ended Oct. 31, a total of 11,756 tons of iron and steel and their products were handled on the Cumberland River and its tributaries.

For the first 10 months of 1928, the Huntington district office of the United States Corps of Engineers reports a tonnage of iron and steel products of 83,318 tons as originating in that district.

Total pig iron shipments from Buffalo through the New York State barge canal during the period of canal navigation were 122,456 tons, according to the Division of Canals and Waterways of the Department of Public Works. In addition, probably 100,000 tons of pig iron was moved in the East by water routes other than the barge canal.

Mississippi River Service Used by Pittsburgh and Chicago

IN August, 1927, the Mississippi-Warrior Service inaugurated barge service on the upper Mississippi River from St. Louis to Minneapolis and St. Paul. Rail connections from Chicago and Peoria, Ill., were established on the river at Dubuque, Iowa. The service was established a little too late to be more than tested in 1927, but during the season of navigation in 1928, not less than 3000 carloads of steel have been handled, including 700 shipped by rail from the Chicago district to Dubuque and thence by barge to Minneapolis. Although the water stage in the upper Mississippi is shallow, no trouble was encountered during the navigable season from lack of a sufficient stage. Most of the shipments were fencing, nails and wire products, but a good tonnage of sheets and steel pipe was moved by Chicago mills. A considerable movement of plates has been made by Chicago mills to St. Louis by rail and then by barge to distributing points along the Mississippi for delivery into the Southwest. The all-rail rate from Chicago to Minneapolis is 27½c. per 100 lb., while the rail and river rate is 23½c. All-rail rate from Chicago to New Orleans is 56c. per 100 lb., while by rail and river the charge is 47c.

Chicago Receives Boat Shipments from Lake Erie

USE of the Lakes for the movement of iron and steel was again heavy. Chicago reports boat shipments of rolled steel of about 100,000 tons during the season of navigation, and water-borne deliveries of pig iron received there and at Milwaukee are conservatively estimated at 39,000 tons, mostly of Cleveland and Buffalo origin. The total includes 2000 tons of low phosphorus iron from England, shipped direct by way of the St. Lawrence River to Chicago. A cargo of 1500 tons of foreign spiegeleisen also was received on direct shipment at Chicago. Six cargoes of pig iron shipped from Lake Erie ports were unloaded at Muskegon, Mich.

Cleveland does not find the volume of water shipments to have varied much in 1928 from that of the year before. There was a distinct decline in pig iron shipments from Cleveland to Chicago, as for some time prices at Chicago were too low to permit shipments even by water and yield shippers a profit. One Cleveland producer shipped 20,000 tons to Lake Michigan ports. Another moved about 30,000 tons to the Toledo-Detroit district.

The United States Steel Products Co. shipped between 130,000 and 140,000 tons of steel on the Great Lakes in the past year to Canadian ports, which compares with 115,000 tons in 1927. This interest has maintained a fleet of four boats with a carrying capacity of 2000 tons each, built especially for the purpose of carrying steel, throughout the entire season of Lake navigation.

A Cleveland producer shipped between 15,000 and 20,000 tons of steel bars by boat to Detroit during the year, and boats also have been used freely in taking steel to Detroit by other Cleveland and Buffalo producers. Actual figures of the movement back to Cleveland and Buffalo of scrap by boat are not available, but it is believed that they exceeded the tonnage of 1927, which amounted to approximately 125,000 tons.

An interesting development of Lake transportation was the employment in 1928 of ore boats, going north without coal cargoes, in taking automobiles from Detroit to upper Lake ports. The Cleveland-Cliffs Iron Co. carried automobiles on the decks, and in some cases below the decks, and did it successfully, thus creating a new source of freight revenue when other kinds of cargoes fail.

What Market Research Will Reveal

Uncovers Opportunities to Develop Sales of Established Products and Create Demands for New Lines— National Organization Suggested

C. H. MACDONALD

WHEN Mr. Hoover with his associates in the Department of Commerce completed the first section of their business survey of the United States, industry in all its phases was given a new viewpoint on business analysis from a sound, practical and economic basis. Business was shown the vital importance of knowing its territory. The habits, customs and characteristics of people in the territory and the natural conditions and resources from which they derive their livelihood were clearly indicated.

With a definite picture of fundamental conditions in any given area, we are surely enabled more effectively to develop sales of established products and to create demand for new lines.

Taking this or a similar broad survey as a basis, there is a growing tendency on the part of business concerns to recognize the value of market research. From such a department the sales organization should receive full and explicit detailed information regarding every trading area in the territory of each district manager and salesman. This information coupled with past sales history affords a medium by which trade requirements and sales possibilities may be measured. Its efforts are not merely directed to finding new markets for present lines of manufacture, but to developing unrealized possibilities within the present markets for lines already being made, and opportunities for additional new products; estimating the demand for these and the reason for such demand. It uncovers weaknesses in other materials and their misapplication to uses where steel or other metals might better serve the purpose.

As a guide to immediate or future expansion, data acquired through the avenues of information employed by market research serve well in laying down such a program if potential markets, competitive conditions, present and future opportunities are considered important factors.

How Research Eliminated Dead Stock

WITH a clear picture of industrial, trade and economic conditions in each division of a territory, and the territory as a whole, simplification by reduction or discarding non-active and unprofitable lines, follows in natural sequence. For example, such analysis developed the fact that a manufacturer catalogued 1750 items in one line. It was found that 85 per cent of total sales over a period of three years was represented by 77 items. Ninety-six per cent of total sales over the same period was represented by 397 items. Thus, 1353 items, representing only 4 per cent of the total sales, were being manufactured, warehoused and carried on inventory from year to year. Many of these items were shown to be dead stock. Others moved so slowly that a decision was soon reached to discontinue their manufacture.

A reclassification of the line was established, with the result that the 85 per cent list was considered as standard and most of the 96 per cent list as demanding more concentrated effort to increase sales on every item listed. The 4 per cent group with such discards as were selected from the 96 per cent group were classified as "special products" not to be carried in stock; and ways and means were immediately sought to dispose of this obsolete or undesirable material to the best advantage. This development as a direct result of market study immediately simplified matters for several departments of the business, including the sales department. A similar condition was found to apply to every other line manufactured and the resultant reduction in inventory ran into several figures, including also the release of a large amount of valuable warehouse space needed for other merchandise.

C. H. MACDONALD is director of sales and head of market research department of the Colorado Fuel & Iron Co., Denver. Previous to his joining this company, he had a long and varied experience in market research, sales promotion and sales management, principally in the textile, building material and steel furniture industries. He was ten years with J. A. & W. Bird & Co., Boston, in market research and sales management. During the reorganization period of the Art Metal Construction Co., Jamestown, N. Y., he was in charge of research and development of new lines.

Overcapacity is a by-word throughout the steel industry. Market research data available to the operating department may frequently prevent a heavy expenditure for equipment contemplated for the manufacture of new products. A knowledge of existing territorial conditions often fails to justify such an expenditure and reveals the fact that some adaptation or plant change may serve to meet a comparatively limited demand, thereby avoiding an inadvisable outlay for new machinery and increasing the tonnage for present equipment.

Market Research Coordinates Departmental Activities

A WELL organized department of market research naturally comes into close contact with many departments of the business, and usually to mutual advantage. Accounting is often brought into closer and more effective touch with sales by the fact that accounting figures are made to mean more, and more figures may be, with good effect, made available to the sales department. Inversely, much market research data are applicable and have proved helpful to the accounting department in its work on costs, analysis and budgeting.

Sales and operating departments are brought more fully to realize their dependence upon one another and the

benefits of closer cooperation as the result of a clearer understanding of the problems of each.

Advertising based upon accurate knowledge of trading areas, territorial weak points, seasonal demand for various products, etc., is more effectively programmed and scheduled to coordinate with sales effort and trade conditions throughout the territory.

Suggest Organization of Research Managers

LOOKING ahead a few years, there is every indication that market research will be recognized as an essential department in every important unit in the metal industry. There is already discussion looking to a national organization of research managers primarily composed of men from different industries or industrial groups. Much benefit would come to the individual members of such a group and much more to the firms represented by them. Inquiry indicates that those companies in the metal industry which have started upon a market research program have in nearly every instance, based upon results obtained, extended the department.

A further encouraging aspect of the situation is the attitude of market research men in this industry, who are inclined to counsel with one another and freely interchange information regarding viewpoints, methods and results pertaining to experience in their departments. So many examples exist to prove the value of coordinated work of this character that few modern executives will withhold either encouragement or support from a movement which tends to closer cooperation and solidarity for an industry which has so many opportunities for trade extension as yet undeveloped.

Employment Becoming More Stable

Labor Released by Mechanization Is Being Absorbed—Skilled Workmen Scarce—Labor Turnover Smallest in History—Group Insurance Shows Marked Gain

IS technological unemployment the Frankenstein of modern industry? Will the benefits from technical improvements in production be lost because of the reduced consuming power of cast-off labor?

The charge has been made that advances in processes and equipment are not merely affecting common labor but are displacing skilled workmen, summarily destroying the value of their hard-earned skill and setting them adrift too old, in many cases, to become proficient in work yielding equal pay. Government statistics covering the past eight years are cited showing reductions in the number employed of 917,000 in manufacturing, 240,000 on the railroads and 800,000 on the farms.

If this labor group of nearly 2,000,000 has, in fact, been forced to enter occupations at lower wages or in part is still unemployed, the loss in mass buying power, now so essential to sustain mass production industries, has been large.

To obtain the views of an authority on this and related problems a representative of THE IRON AGE interviewed Arthur H. Young, industrial relations counsel, New York, for many years identified with employment work of the iron and steel and other industries in both active and consulting capacities. Quite naturally the current situation in industrial relations is a prime consideration in discussing the real or fancied complications arising from unemployment. The first question, therefore, was:

"What has been the trend of employment and wages in manufacturing during 1928?"

"Wage rates have remained virtually stationary," Mr. Young replied, "while the trend of employment has been steadily upward. The unemployment problem," he added dryly, "disappeared at the close of the Presidential campaign."

"What has become of the army of 2,000,000 workers released by manufacturing, farming and transportation in the past eight years?"

"Although I cannot state definitely how and where this surplus man power has been absorbed, we are receiving no reports of long queues of applicants at factory doors. An important fact frequently overlooked in considering unemployment," said Mr. Young, "is that labor displacement through progress in production technique is rarely sudden, but is rather a gradual evolution. It should also be borne in mind that the figures of the Bureau of Labor Statistics, on which calculations of labor displacement are based, do not cover employment in new industries or new forms of business."

"Do you consider the position of the skilled workman imperiled by technological advances?"

"The best answer I can give to that question is that at present there is actually a shortage of skilled mechanics, with the possible exception of molders. A scarcity of skilled men has been with us since 1921—a fact to which the renewed interest in apprenticeship training is ample testimony. Occasionally a technological development of revolutionary character releases considerable numbers of men suddenly, but that is the exception rather than the rule. American labor, in recent years, has been disposed to accept such changes philosophically as the price that must be paid for progress. In fact, no one is more keenly alive to the dependence of high wages on improved production methods than the enlightened workingman. He is well aware that backwardness, rather than leadership, in mechanization characterizes many of the companies in the textile and coal industries, which have been the scene of the most recent industrial disputes.

"However, the abrupt dislodgment of labor has so many sequences intimately touching the lives of the workingmen affected that management itself, in some instances, is recognizing it as a problem calling for more than casual consideration. More consistent efforts are being made to absorb displaced workers in other parts of the same organization, and in other cases dismissed employees have been given post-employment wage payments to tide them over until they can find new jobs. One large company, which recently introduced a revolutionary labor-saving process, is paying the skilled workmen dismissed up to $150 a month for periods up to 24 months in proportion to length of service and previous wage rates.

"Employers in increasing number are impressed by the close relationship between prosperity and stability of employment at good wages. The American manufacturer is primarily a purveyor to demos. As Eugene G. Grace,

president of the Bethlehem Steel Corporation, recently said, 'American industry faces no more important task than that of protecting the buying power represented by wages.'"

"The incomes of a large majority of American families, according to recent studies, are reported to be still below a mere subsistence level. Does not such a condition definitely limit the development of luxury industries and forms of personal service, which are now relied on as outlets for surplus labor?"

"Such studies are not conclusive. The measuring stick, the subsistence level, is an arbitrary creation of the investigator and is influenced by his personal conceptions of living standards. It must be borne in mind, moreover, that many items now considered necessities in the family budget were formerly regarded as luxuries. Minimum living standards have risen. In achieving new standards it is inevitable that some groups of our population should lag behind others. Prof. Samuel McCune Lindsay, in a paper delivered before the Academy of Political Science, stated that at no time since the industrial revolution has there been more than 50 per cent of the number of wage earners contemporarily earning as much as the so-called 'minimum subsistence budgets.'

"That the production of luxuries and the rendering of personal service is steadily on the increase is a fact apparent to the most casual observer. This rapid growth is one of the chief characteristics of our economy distinguishing it from that of Old World countries. I need merely mention my surprise in discovering that a leading London hotel had no barber shop and that I would have to walk four blocks to find one."

"Are American manufacturers consciously promoting stability of employment?"

"Yes. Scientific management has placed great emphasis on the reduction of labor turnover. In fact, a decline in labor turnover and a rapid growth in group life insurance are the two most significant developments in industrial relations in 1928. Large organizations like the Bethlehem Steel Corporation and E. I. du Pont de Nemours & Co. had the smallest personal turnover in history, and a similar situation was revealed in a survey of a large group of manufacturers by the Metropolitan Life Insurance Co. The Bethlehem record is of particular interest to me as a former steel man, because in years past peak production of steel always meant a high labor turnover.

"Undoubtedly there has been a change in the conscious attitude of the management. The hiring of men for temporary work is avoided so far as is possible, and stability of employment is also promoted by following a policy of forecasting labor requirements and planning manufacturing operations accordingly.

"Group life insurance has become a major factor in industrial relations, now protecting nearly 25 per cent of American industrial employees to a total sum of seven and one-half billion dollars. This means an average payment, in case of death or total disability, of $1,000 per man.

"Pension plans are also in the ascendancy. Only six formal plans were in existence in this country before 1901. Twenty-four were adopted in the next five years, 27 in the period 1906 to 1910, 96 from 1911 to 1915, 82 from 1916 to 1920, and 24 in the two years 1926 and 1927. Including the 'informal' plans and those combined with some form of thrift or savings scheme, there are now 466 pension plans in operation, with a total annual disbursement of $50,000,000 to 80,000 pensioners.

"Contributory pension plans have found greater favor in recent years than those of the non-contributory type. Only 7.4 per cent of those adopted in the five years, 1906 to 1910, were contributory. For the years 1926 and 1927 the proportion was 62.5 per cent."

"The pension plan has been criticized, Mr. Young, as a device intended to tie up employees with their companies."

"That criticism is not warranted. In the case of contributory plans companies return to employees leaving their service all that they have paid in, usually with the addition of 4 per cent compounded and sometimes with interest at the rate that the pension fund is earning. Furthermore, the pension plan doesn't have any influence on the employees' attitude until after at least 10 years of service. Most labor turnover is in the first five years; after a decade of service employees usually regard themselves as fixtures."

"Do you favor State Unemployment insurance?"

"Such insurance is aimed primarily at cyclical unemployment, from which we have been relatively free in recent years. The necessity for it is not now acute, and it is my earnest hope that preventive and alleviative measures taken by management and men in voluntary cooperation will permanently postpone such socialistic experiments."

"Do you approve of the proposal that the Government defer public work until periods of depression and unemployment?"

"No speech or legislation or article on unemployment seems to be complete without it, but I am inclined to doubt the practicability of the plan. There would be difficulty in delaying Government work of a pressing character until a time of depression, because such a period might not come for several years. I have heard no suggestions of a postponement of work on Boulder Dam or of the immense

ARTHUR H. YOUNG directs the work of the Industrial Relations Counselors, Inc., New York, an organization for industrial research and consultant in personnel administration for a number of leading corporations. After entering the employ of the Illinois Steel Co. at Joliet, Ill., as a boy, he later went to the Minnequa plant of the Colorado Fuel & Iron Co., Pueblo, Colo., in 1905, returning to the Illinois Steel Co. as timekeeper at its Chicago works. Advancing to supervisor of labor and safety, Mr. Young left the Illinois Steel Co. in 1917 to become director of the American Museum of Safety and served as the Government's chief safety expert during the war. He was manager of industrial relations of the International Harvester Co., Chicago, from July, 1918, to July, 1924, when he went to New York to become industrial relations counsel for the law firm of Curtis, Fosdick & Belknap. In May, 1926, his staff was reorganized as the Industrial Relations Counselors, Inc. Mr. Young was co-author of the International Harvester Co. works council plan. He was president of the National Safety Council from 1921 to 1922, and is vice-president of the American Museum of Safety

task of harnessing the flood waters of the Mississippi River.

"There are also practical obstacles to the successful execution of such a plan. The paper work preliminary to undertaking a project always takes considerable time, and in addition bids must be taken and contracts awarded before actual construction work can go ahead. By the time all these necessary details are attended to the opportunity to relieve a business depression may have passed.

"Proposals of this character were made at the time of the first Harding unemployment conference, but nothing tangible resulted from them."

"What is your attitude toward proposed legislation providing for more complete Government statistics on employment and the creation of a national system of employment offices?"

"I heartily favor the passage of such laws. We are in great need of a national clearing house for statistics of employment and unemployment. Virtually every other country of industrial importance has one."

Why and How to Train Foremen

Information on Business Policy and Other Departments Given in Monthly Dinner Meetings—Specific Problems Then Discussed in Light of General Principles

BY A. D. LYNCH*

NECESSITY, working in different plants and in different localities, has already brought some form of foreman training into a large part of industry. Motives vary. In some places foreman training has been fostered by management driving for more efficiency in operation and deciding that better foremanship was one means of securing it. In other places it has been sought by the foreman when he recognized the necessity of better personal equipment for his job if he were to advance or even retain his position.

There can no longer be any question as to the pressure of necessity from both sides; industry needs more efficiency in operation, hence, better foremanship, and the individual foreman needs to be developed to meet these requirements. There can therefore be no question but that both the industry and the foreman will benefit from a proper training course. The questions now remaining are what constitutes a proper program of foreman training, and who should conduct it.

What are the duties of a foreman? What are the responsibilities of foremanship? These things must be fairly well determined before we can intelligently answer the question as to what constitutes foreman training. Manifestly, a proper training course is one that will prepare the foreman to better fulfill his duties and meet his responsibilities. If we can agree on what the job is, then it only remains to show that job to the foreman and train him to do it.

The Duties of Foremanship

Stating them most concisely and comprehensively there are two main functions of real foremanship: first, getting out the product, and second, handling his people. The first of these of course includes the second, but we will progress in a more orderly manner by considering them separately.

In getting out the product the foreman is responsible for

1. Maintaining the quality of the product
2. Cost, direct and indirect
3. Schedules
4. Maintenance of plant and equipment
5. Cleanliness and orderliness
6. Economy in operation

"Handling people" means to build up around himself in his department a group competent in every way to do the work required, and to know and supervise this group and their work in such a manner that he will meet the desires of his management on quantity, quality, and cost of product and have a friendly, interested, stable group of workers. To do this he must be able to

1. Place his men according to their ability and capacity
2. Give instructions properly
3. Manage individual workers according to their temperament
4. Delegate work and responsibility correctly and supervise it properly
5. Set a proper example for his people
6. Maintain discipline

Personally he should possess a skill and knowledge of the work more than that of any of his workers, and he must administer his department with honesty, fairness, sympathy, judgment, openmindedness and human understanding.

Many Foremen are Merely Expert Workmen

IF these are the duties, responsibilities and qualifications of good foremanship (and careful analysis of the job will demonstrate that they are), then what are the qualifications of the average individual who is inducted into foremanship, where does he come from and how does he attain that position? The majority of the foremen now in industry came up from the ranks through successive steps to their present position and largely because of one specific qualification, namely: skill and knowledge of the work to be done in the particular department for which they were selected. How are such men to know the full requirements of their new jobs? How are they to fit themselves quickly to meet such requirements? Is it reasonable to expect any foreman to know all these things when it is only within recent years that management has recognized many of them? Obviously it is management's job to show to a foreman a true picture of his job and then train him to fill that job.

Organization of "Foreman's Clubs" has been the logical development to meet this need. Clubs have been formed among foremen in individual plants, and also in city-wide groups affiliated with State and National organizations. The club in the plant is usually initiated by its own management. City or community groups are organized by the foremen themselves and represent their expression of a desire for better equipment for their daily work.

*Director of personnel, Ohio Brass Co., Mansfield, Ohio.

Unfortunately a city or community club cannot give what is needed. The contact with other foremen is beneficial, the discussion of general problems will help, but what the foreman needs is specific instruction and training along practical lines that he can use on his own job. Only his own management is in position to give him these things, for it formulates the policies under which he works.

How to Train Foremen Successfully

A COURSE in training initiated and planned by management can be conducted easily and can be made of real interest and benefit to those participating.

Foremen, assistant foremen, instructors, or anyone in the organization having direct supervisory charge of people should be included in the group. Meetings should be held after working hours, since otherwise a meeting for all who should be in the group would leave all departments without supervision during working hours. The most satisfactory arrangement is to meet for dinner and have the business session immediately following. If the plant does not have its own cafeteria, arrangements for dinner and a meeting can easily be made elsewhere. It is worth the cost to provide a proper meeting place and a good dinner to start each meeting. Monthly meetings on a regular fixed date, as, for example, the first Monday each month, will be found most satisfactory.

Meetings at the start should be conducted by the executives, preferably the General Manager or Factory Manager. From the start the program should be one of education in the business facts and policies of the company. If foremen are to have a real interest in their work, and if they are to be able to carry out the policies of management, they are entitled to know *all* the facts of the business and the management's policies. Several meetings can be very profitably spent on these things. Most managers will find many policy matters that are very definitely fixed in their own minds, but on which no open expression has ever been given to foremen or people.

When this phase of the program has been completed, sub-executives would in turn explain the workings and policies of their departments. Manufacturing superintendent, production manager, cost manager, personnel manager, technical and engineering department heads should each give the foreman all the facts and figures of his department. This may seem a revolutionary plan to some executives, but such should remember that unless you are willing to give these things to your foremen you cannot hope to have them work intelligently.

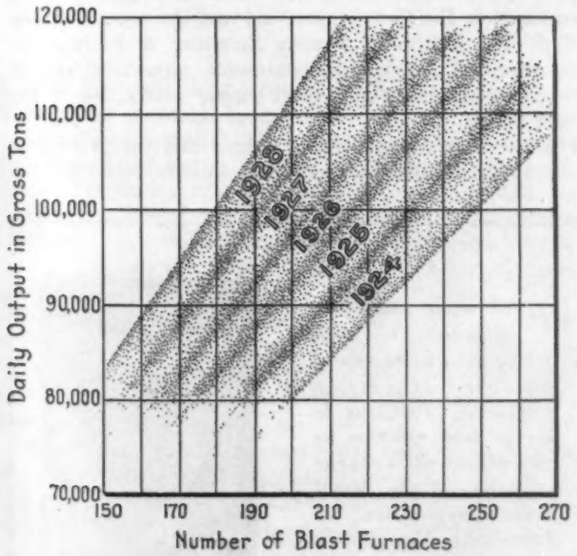
When this second and longer phase of the program is completed, the club is ready to become actually a foreman's club. The daily problems that arise in the plant may then be used as subject matter.

That such a plan will receive the enthusiastic cooperation of the foremen and sub-executives is proved by experience at Ohio Brass Co. The club at Mansfield was developed along these lines, has been in existence for 10 years, has met regularly, and has never lacked interesting and instructive subject matter. It started with 40 members and gradually grew to 80. It has had through the 10 years 98 per cent attendance. This is an indication of interest, as attendance is not compulsory. The average business meeting lasts two hours.

The kind of foremanship any plant has or gets will depend directly on the interest the management of that plant takes in its foremen.

Increasing Blast Furnace Efficiency

HOW marked has been the increasing efficiency of individual blast furnace operation may be gathered from the accompanying chart, which shows the performance zones, so to speak, of the past five years. A 90,000-ton daily production in 1925 was obtained from 200 furnaces on the average; or a 105,000-ton output in 1926 came from 220 or more furnaces, or 110,000 tons in 1927 was supplied by no more than roughly the same number, or 220 furnaces.



The dotted areas indicate the number of furnaces required to supply a given output, progressively fewer furnaces sufficing from year to year

The chart shows that to produce 100,000 tons a day in 1924 required, say, 240 furnaces, whereas to produce the same tonnage in 1928, or five years later, needed only 185 furnaces. The same output was thus obtained in 1928 with 55 fewer furnaces, or 23 per cent less. Figures of the kind are a commentary on the results of rehabilitating stacks, enlarging parts, and increasing blast pressure, and also indicate the influence of the latter-day constructions. They stand also as illustrating the increasing unlikelihood of putting into service blast furnaces that have been long idle and are uneconomic in comparison with the furnaces which have been at least intermittently operated.

Composite Prices

THE IRON AGE composite price of scrap, discussed on page 14, is here shown in comparison with recent composite prices for pig iron and finished steel:

	(Per Gross Ton) Steel Scrap	Pig Iron	Finished Steel, Per Lb.
1925 *average*	*$17.12*	*$20.58*	*2.465c.*
1926 *average*	*15.48*	*20.42*	*2.439c.*
January, 1927	15.17	19.44	2.432c.
February	14.58	19.07	2.378c.
March	14.65	19.03	2.367c.
April	14.71	19.21	2.360c.
May	13.95	19.09	2.360c.
June	13.60	18.92	2.369c.
July	13.48	18.56	2.367c.
August	13.80	18.17	2.367c.
September	13.92	18.03	2.357c.
October	13.48	17.96	2.319c.
November	13.18	17.59	2.299c.
December	13.48	17.55	2.310c.
Year's average	*14.00*	*18.55*	*2.357c.*
January, 1928	13.70	17.63	2.318c.
February	13.71	17.73	2.361c.
March	13.65	17.73	2.362c.
April	13.81	17.67	2.359c.
May	13.90	17.45	2.350c.
June	13.52	17.23	2.341c.
July	13.13	17.10	2.325c.
August	13.75	17.11	2.348c.
September	14.75	17.54	2.348c.
October	15.85	17.94	2.363c.
November	15.73	18.46	2.368c.
December	15.92	18.51	2.385c.
Year's average	*14.29*	*17.67*	*2.352c.*

Prospects for Copper, Tin and Zinc

Authoritative Surveys of Production, Consumption and Prices Leave a Bright Picture

TENDENCIES in three of the major non-ferrous markets are discussed in the subjoined reviews obtained from men of standing in the fields covered. The course of these markets is of increasing importance owing to the ever fuller interlinking of copper, zinc and tin with the metal-working industry generally. Indications are for a year of promise beyond 1928.

Copper Market in Strongest Condition Since the War

BY EDWARD MOSEHAUER

THROUGHOUT the past year, the copper price trend was either upward or stationary without a single dip or recession. This is the first time such a condition has prevailed, with the exception of the war period.

Course Halting Early Last Year

Beginning in January at 14.12½c. per lb., the price moved slowly upward through February, March and April and in May extremely heavy sales were made at 14.75c. At that level the price remained unchanged until in August renewed buying finally culminated in September in a wave of buying that carried the price to 15.25c. per lb. During September, producers sold more than half a billion pounds of copper. Insistent demand for the metal continued and the price advanced to 16¼c. in December, as the year approached its close.

The state of business in the copper industry at the beginning of 1928 was halting in character but optimism prevailed. Not until May was this optimism translated into sales. Then the buyers forsook their hand-to-mouth buying policy and covered their requirements well into the future periods.

Again in September, after the advance from 14.75c. to 15c. per lb., fabricators were deluged with business and were compelled to purchase record breaking tonnages. At that critical point, namely a 15c. price, it was generally known that wage scales in the mining districts would be raised and anticipation of further advances in price caused the ultimate consumer to cover actual and estimated requirements for the balance of the year.

Foreign trade has been steady. The principal countries have all increased their imports and France has shown the greatest improvement. Producers are well sold through January, February and into March, this year. Stocks of refined copper at the end of November were about 45,000 tons less than they were Jan. 1, 1928. Foreign stocks likewise have been depleted and consumers abroad will have to enter the market for substantial tonnages for the nearby future months. Domestic consumers are not carrying burdensome inventories.

Merged Groups of Fabricators a Development

A decided trend toward stabilization has been perceptible during the past year. The fallacy of wide fluctuations in price, when statistics reveal a steady rate of consumption, has been impressed upon seller and buyer alike. Never before has there existed such a true conception of interdependence between the buyer and the seller.

Merged groups of fabricators evince a keener interest in maintaining the value of huge tonnages in process in their plants and are less prone to influence the market for fluctuations in price.

The advantages of the various associations within the industry for collecting and disseminating statistical information have been marked. The capable direction of the Copper Institute, Copper Exporters, Inc., Copper and Brass Research Association and the American Bureau of Metal Statistics has made these organizations examples for other industries to emulate.

Throughout the year rumors of impending mergers and conjectures regarding the companies to be merged were rife. Banking interests were active in ascertaining the terms upon which brass and copper manufacturers would consent to a sale of their properties or assets.

The outstanding successful culmination of such efforts has recently been announced. The Republic Brass Corporation has been organized and incorporated and has acquired the Rome Brass & Copper Co., the Michigan Copper & Brass Co., the Dallas Brass & Copper Co., the Taunton-New Bedford Copper Co., and the copper rolling mill of the Baltimore Copper Smelting & Rolling Co. This group of fabricators represents approximately 20 per cent of the brass and sheet copper production of the United States.

The plants are strategically located and the previously successful operation of the units augurs well for the

FOR many years Mr. Mosehauer has been active as a sales representative of copper producers. Previous to his present position as vice-president in charge of sales of the Metal Sales Corporation, 25 *Broadway, New York, he was associated with the Chile Exploration Co. and the United Metals Sales Corporation, New York*

future of the new corporation. The management is in capable hands and substantial economies in operation are made possible. No doubt other fabricating companies will in time be absorbed until the total tonnage controlled is much larger.

On account of the important holdings of the common stock of the Republic Brass Corporation and the General Cable Corporation by the American Smelting & Refining Co., and a similarity in their financial structure, it is a fair assumption that eventually both these groups will be consolidated. In that event, the combined group will represent 30 per cent of the wire industry and 20 per cent or more of the brass and copper fabricating division of the industry.

The Phelps-Dodge Corporation, New York, is also negotiating with brass and wire companies, but no public announcement having been made, the extent to which this corporation will enter the fabricating field is still problematical. The Anaconda Copper Mining Co., with its subsidiary, the American Brass Co., is credited with control of 45 per cent of the brass fabricating capacity and 40 per cent of the wire business of the country.

New Mergers Mean a New Era in Copper

The final results of these new alinements are not yet appraisable but a new era in the evolution of the copper industry is in the making.

Statistically, the industry is in a most favorable condition. Production has not yet met the demands of consumption and it is imperative that it shall not only meet but that it shall exceed and continue to exceed the consumptive demand.

The average monthly shipments, domestic and foreign, for the first 11 months of 1928 exceeded those of a like period of 1927 by 12,235 tons per month. Average monthly shipments for the months of July to November, 1928, inclusive, exceeded those of the average monthly shipments of the entire year 1927 by 23,165 tons.

If the present rate of consumption continues at the rate at which shipments have been made during the last half of the year, large increases in production will be warranted.

The necessity of larger refining stocks cannot be denied—one need only picture the result of a breakdown in a single refinery or a diminution of the efficiency of the transportation systems to appreciate the good fortune of the fabricators in having been spared these possibilities during the past year.

More Buying of Fabricating Plants

The trend of developments in the industry for 1929 would seem to indicate a further acquisition by producing interests of fabricating plants. This leads naturally to more concentrated buying and, for reasons cited above, enlists the consuming interests on the side of price stabilization.

Reference may be made to the construction of a new refinery in the Southwest by a group including the Phelps-Dodge Corporation, the Nichols Copper Co. and the Calumet & Arizona Mining Co. The sales department of the Phelps-Dodge Corporation has been combined with that of Nichols Copper Co. and a new company, the Phelps-Dodge Sales Co., Inc., has been incorporated.

Horizon Is Bright for 1929

For 1929 the horizon is bright. Comprehensive plans for electrification projects of the first magnitude, ever-increasing use of electrical power, expansion in telephone service, the use of copper products in buildings, unprecedented automobile production, with well directed efforts for developing new uses for copper make it safe to predict a demand for the metal in 1929 that will require a full production program at the mines. The law of supply and demand will take care of the price.

Enhancement in value of copper shares and increased dividend distribution affords gratification for stockholders, reflects the prosperous state of the industry and records progress.

Tin Consumption to Expand in 1929

BY JOHN P. WILSON

LAST year was disappointing in the tin trade. Prices steadily declined during the last half of the year, while the huge capital investment, thrown into the producing end, had begun to show results in increased supplies. Prophecies of even greater production and still lower prices were freely made. Our leading tin consuming industries—automobiles and tin plate—had fallen far behind the records hung up in 1926, and 1928 being a presidential election year added to the uncertainties, so that optimistic views were voiced with caution. The forecasts of larger production and lower prices were fulfilled, but the recovery in American consumption has even exceeded that of 1926, and 1929 is expected to show further expansion.

Of the four principal non-ferrous metals, our supplies of tin are all imported. For many years past London has been the dominant influence as to the price of tin, although American demand, as it increased or decreased, was a potent factor in deciding the market trend.

Average prices during the years 1924 to 1927 inclusive, and even for the first 10 months of this year, have been much higher than at any time before the World War; yet with the exception of certain alloys such as babbitt metal, high-grade solder, etc., the tin portion of most articles in which it is used is so small that the high price apparently has had little effect upon consumption, and we became accustomed to 50, 60 and even 70c. tin when conditions of supply and demand seemed to justify it.

America Will Use More Tin Than Ever

ENTERING the new year we are faced with the practical certainty that America will use more tin than ever before. Unless statistics are utterly valueless, Great

AS a Background Mr. Wilson Has an Extended Experience in the Complicated Tin Market. As a broker at 111 Broadway, New York, he writes with authority. He was active in the formation of the new National Metal Exchange which opened in New York Dec. 3

Britain and the Continent consumed more tin in 1928 than formerly, and we have no means of estimating what the change will be, if any, during 1929. Assuming they will hold their own, the two great points of interest are: Will tin production continue to gain over world consumption, and will the price trend be toward higher or lower levels?

During the period June 30 to Nov. 30, 1928, the world's visible supply has shown an increase in each of the five months for a total of 5800 tons, yet the price has risen in the face of such adverse statistical conditions.

The United States practically fixes the price of the other non-ferrous metals, and is the world's largest producer of them. British interests control the production of two-thirds or more of the world's tin, and a strong campaign, inaugurated by a group of British capitalists owning stock in a number of producing companies, was launched some time ago to force up the price to a point which will insure more profitable returns on their investment.

It would be useless to give here an account of their aims and methods, or to recite the reasons they give in justification of their stand. Against the best efforts of a strong bear party, they have absorbed the bulk of surplus supplies coming on the market; they show no signs of weakening and, after carrying the price to above 50c. per lb. at the beginning of December, are now holding it at around 49.50c., and the opposition party appears unable to force it lower.

Tin Is a Controlled Market

WE are in a controlled market. If the metal were left to the free play of the law of supply and demand, there is scarcely a doubt that the price would be much lower today, and might continue downward for some months to come. Seldom, if ever, in the past have efforts to control production, regulate distribution and stabilize the price of a commodity at a level well above its real value, been ultimately successful. However, tin bulks so small both as to tonnage annually produced and aggregate value of a year's output, as compared to copper, cotton, oil and other staple commodities, that existing conditions may be prolonged for an indefinite period, providing there is ample capital behind the movement. Its prospects of success would also be brightened if the other leading producers should lend their active assistance. However, these factors are matters for the future, and are beyond the realm of our ability to forecast.

This brings us to the final and perhaps the most important feature of this article: What to do in the face of so much uncertainty, and how to protect ourselves against being on the wrong side of the market should price fluctuations be as wide and sudden as they have been in recent years. To enlist attention to this important matter, we give the following range of prices during the past 10 years in cents per lb.:

	High	Low	Range
1919.....	72.50 H	52.75	19.75
1920.....	65.00	32.50	32.50
1921.....	39.00	25.50 L	13.50
1922.....	39.00	28.75	10.25
1923.....	51.50	37.50	14.00
1924.....	59.00	40.00	19.00
1925.....	64.50	50.00	14.50
1926.....	72.50	58.50	14.00
1927.....	71.00	56.12½	14.87½
1928.....	57.75	45.75	12.00

These price extremes often come with amazing rapidity. For instance, in 1924 the high point of 59c. was reached about the middle of March, yet on May 23 of that year, a trifle more than two months later, the price had dropped to 40c. Not one consumer in a hundred is ever "short" of the market, so how must those who bought tin in March, for May delivery, have felt with a loss of $10,640 per carload of 25 tons staring them in the face?

A way has been opened to insure against just such contingencies through the opening on Dec. 3, 1928, of the National Metal Exchange, Inc., in New York.

Value of the National Exchange

The opening of the National Metal Exchange has necessitated the assembling of much larger stocks of spot tin at this port, and with the constant inflow of further imports, there is ample tin for all needs. By following the practice of buying standard tin to protect one's sales of tin plate, automobiles, babbitt, etc., one can resell it and buy real tin whenever the latter is needed, and secure shipment in just the tonnage and at the time desired, and thus release the greater portion of the capital now used in financing requirements.

If one feels he must carry surplus stocks as protection against possible stoppage of imports, or any other seemingly remote cause, he may carry them at New York where the market is, so that they may be resold if desired on short notice. Banks are glad to lend support on such high-grade collateral. Moreover, there are many times when actual spot tin commands a high premium, which would make it possible to sell the spot metal and buy the delivery really needed.

Having opened up a subject of general interest, and about which there seems to be so little understanding, the least one can do in closing is to suggest that any reader still in doubt should write E. A. Brennan, secretary National Metal Exchange, Inc., 27 William Street, New York.

Future of Zinc Healthy After a Dull Year

BY AN AUTHORITY IN THE TRADE

WHEN sufficient time has elapsed to give a fair perspective of the year 1928, it is not impossible that the real turn for the better may be seen to have occurred during the latter half of November, after nearly two years of depression.

Selling pressure, which had existed throughout 1927, continued into the new year, and in February the low point was reached when the price touched 5.40c., East St. Louis, with rumors of transactions fractionally lower. At anything like 5½c. per lb., spelter looked cheap, and substantial covering, both for near and forward positions, resulted, and the price worked slowly upward until by the end of May it had crossed 6c.

Meanwhile, although production had remained but slightly in excess of consumption plus export, a gradual though small increase in visible stocks was noticeable and, as a result, curtailment began to show by the end of June, which had the effect of strengthening the situation somewhat, and by August the quotation had risen to 6¼c., East St. Louis, at which level it carried into November, with more or less firmness.

Buying Movement Late Last Year the Feature

The really outstanding feature of the 12 months was the sudden buying movement which began in mid-November, after four months or more of a stagnant, featureless period, with but little interest exhibited in the metal. Whether the results of our general election gave confidence for the future, or a betterment in the London market indicated the possibility of higher prices here, the expres-

sion of it was manifested in a buying movement of enthusiastic proportions.

First quarter zinc was bought heavily, with some business extending into the second quarter of 1929. Producers, after the long dullness, appeared willing enough to place forward tonnage on their books, and sold freely, the result being that the price moved upward only 10 points, to 6.35c., on an unusually large volume of sales, but the year closed with a more satisfactory situation existing than at the beginning.

Based upon the figures available for 11 months, it would seem that the year's production of spelter may reach or closely approximate 620,000 tons, an increase of some 6000 tons over 1927, but less than in 1926 by 18,000 tons in round figures.

Domestic consumption for 1928 appears to be well above the previous year's total, and should closely approach 580,000 tons with December estimated, as against 549,735 tons for 1927 and 583,801 for 1926.

On the other hand, exports fell off sharply in the latter half of the year, and will probably not exceed 35,000 tons. This is a loss of about 10,000 tons in overseas markets from the previous year and about 7000 less than for 1926.

Domestic stocks, which stood at 40,751 tons on Jan. 1, 1928, were 46,542 tons on Dec. 1, a gain of nearly 6000 tons for 11 months. It may be said, however, that supplies in consumers' hands were probably appreciably less than a year ago.

Depression Last Year Was World Wide

The depression which the industry had suffered during the greater part of 1927-1928 was of a fundamental nature, and not confined to this country. World stocks increased from 61,800 net tons, the figure reported as of Dec. 31, 1927, to 74,100 tons on Nov. 1, 1928. The lack of confidence was reflected in the London market, where quotations fell below £25 in the late spring and remained steadily between £24 and £25 throughout the summer and fall. This not only checked export from this side, but at one time the spread approached the import point, a condition which has not occurred for many years. Betterment on the London market was noticed early in November, after spot spelter had broken to £23 17s. 6d., and a gain of between £2 10s. 0d. and £3 from the October average was accomplished by early December.

Electrolytic production was increased in our Western fields by about 50 per cent addition to existing plants early in the year, and a new operation of 50 tons nominal daily capacity which came in late in the fall, while another of similar size is under construction in the Mississippi Valley and expected to be producing before July.

Altogether, a healthier picture is presented by the industry at the beginning of 1929 and, if not entirely recovered from its depression, it perhaps may have entered the convalescent stage.

Railroad Equipment Buying Declines

(*Concluded from page* 38)

available for service was 310,155, while the minimum surplus supply was 79,016 cars. Both surpluses developed during the peak transportation year of 1926, the maximum surplus on Jan. 8 and the minimum surplus on Oct. 23. The division made an estimate that the surplus would reach 335,000 cars on Jan. 1, 1929, compared with 464,000 cars for Jan. 1, 1928, and 275,000 cars on Jan. 1, 1927. These figures have been cited to support the claim that the railroads as a whole have more than a sufficient supply of cars to meet transportation requirements, even in times of greatest activity.

From Jan. 1, 1923, to Sept. 30, 1928, a total of 707,108 new cars were put into service by Class I railroads, a yearly average of 88,388, and, with two relatively unimportant exceptions, the purchases have shown a decrease each year since 1923 in all types of cars. The two exceptions pertained to a slight increase in purchases of flat cars and miscellaneous types in 1928 over 1927. The purchases since 1923 represent approximately 30 per cent of the present car ownership and therefore would mean that a complete turnover or replacement would require 20 years, or the life of the average car.

Locomotive Supply Also on Down Grade

OWNERSHIP of locomotives followed the trend of car ownership, declining from 64,596 on Oct. 1, 1923, to 59,602 on Oct. 1, 1928, the decreases being consistent during each year. The aggregate tractive power increased from 2,491,317,836 to 2,582,392,819 lb., a gain of 91,074,983 lb., the only decrease having been in 1928 when compared with 1927, the latter year showing a tractive power of 2,605,178,007 lb. The average tractive power increased from 38,568 lb. on Oct. 1, 1923, to 43,327 lb. on Oct. 1, which reflected a constant increase each year.

The maximum surplus of locomotives during the six-year period was on Jan. 1, 1928, with a total of 7490 available for, but not in, service. The minimum surplus locomotives available for service in 1928 reached the comparatively high total of 5098, the greatest minimum surplus of the six-year period. Both these figures were pointed to as denoting the ample supply of motive power the railroads now have. Their significance is heightened when compared with the situation applying in 1923, when both the maximum and minimum surpluses were the lowest any time during the six years. The maximum surplus that year was on Dec. 15, with a total of 3992, while the minimum surplus was reduced to only 555 on Jan. 15.

The total number of locomotives placed in service from Jan. 1, 1923, to Sept. 30, 1928, was 13,458, which represents a little more than 22 per cent of the total ownership as of Oct. 1, 1928. The actual decrease in the number of locomotives on the latter date, when compared with Oct. 1, 1923, was 4994, so that in effect the railroads have actually scrapped 18,452 locomotives during the six-year period, or approximately 50 per cent more than were replaced during that time.

Outlook Regarded as Promising

COMMENTING on the railroad equipment outlook, the Union Trust Co., Cleveland, said in a recent published statement:

"All of the figures which go to measure the efficiency of equipment seem to indicate fairly clearly that the limit of efficiency with present physical property and equipment has been reached, and that further gains in efficiency will require new expansion policies. Electrification and similar policies now being put into effect make for a brighter future for the companies supplying this type of equipment. The necessity for a considerable scrapping of old wooden cars in the next two years is also a strong point in the situation. Already some of these facts are beginning to affect orders for new freight cars, although locomotive orders have not as yet shown signs of improvement.

"It would seem that the period of decline has drawn to a close for the rolling stock industry. While no great boom of railroad equipment buying is in immediate prospect, the outlook is the most promising of any time in five years."

A Year of Many Industrial Mergers

List of Consolidations in Metal-Working Field in 1928 Is Formidable—Advantages and Disadvantages of Merging Compared

MERGERS in the metal-working field in 1928 were numerous. While several were consolidations of producers of basic products, such as steel sheets and steel tubes, a far greater number, as would naturally be expected, were combinations of companies fabricating finished products. In some instances direct competitors combined, in others manufacturers of supplementary or allied lines were brought together. Certain consolidations were purely local, taking in plants in the same city.

The motives for mergers are many. One of the most important at the present time is the desire for protection against demoralized prices. With capacity excessive in most industries, pressure for business volume has been stimulated and competition has been accentuated, to the detriment of profits. In seeking a way out of this dilemma manufacturers have logically turned to cooperation, through trade associations, and to mergers.

The narrowing profit margin per sale also places fresh emphasis on cost reduction, again commending the merger, particularly for the possibilities it offers in distribution economies. In fact, the current trend toward consolidation gets its main impetus from marketing considerations—first, the need for controlling output and stabilizing markets; secondly, the savings obtainable from centralized buying and selling. Purchases in larger quantities mean increased bargaining power; pooling of sales eliminates duplication of selling effort. From the production point of view too the merger brings benefits, especially in industries making mass goods, where economies are so largely dependent on business volume.

Not the least of the advantages accruing from consolidation are increases in financial strength, permitting the adoption of the latest scientific methods and supporting broader technical and market research. Greater financial resources likewise are important to carry on installment selling, which has become an established policy in merchandising consumer goods.

Danger in Overdoing Mergers

THE merger idea is not new. Large industrial combinations were formed in the 80's, 90's and early in this century. The present danger is that mergers will be overdone. When consolidation is mainly for the purpose of manipulating stock and obtaining large promotion fees, it is undesirable. Moreover, if companies are merged making a variety of widely different products, the benefits from unifying administration, sales and production departments of the component organizations are likely to be illusory. The diversity of products restricts the economies possible in output. Similarly there is a limit to the number and kind of goods that a salesman can successfully handle. His effectiveness is likely to decrease as his efforts are diffused.

The personal element is too frequently ignored in considering the merger problem. While the head of a small company rarely possesses the well rounded ability that can be expected from a group of executives in a larger organization, he has a stronger incentive to achievement, especially if he has a large stake in stock ownership. In addition, he has the advantage of closer relations with his organization and his trade. The larger a company grows the farther its executives are removed from intimate contact with employees and customers. There is a loss in esprit de corps, on the one hand, and in good will on the other.

Proponents of mergers sweep aside these criticisms by pointing to the larger profits usually shown by big companies, and their greater stability, a fact emphasized by the high mortality among small enterprises. An organization is surer of success, they contend, when the complex functions of management can be subdivided, with separate executives to direct production, sales, merchandising, engineering, styling, financing, advertising, etc. A large company, they assert, can afford to hire the best brains for a given position.

It is true that big business puts a premium on ability of a high order, but is is also common knowledge that there is scarcity of superior managerial capacity. Furthermore, the impersonal character of control in many large corporations, with insistence on profits crowding out other considerations, sometimes begets a high rate of executive turnover. Although the purpose of all business is primarily to make money, the morale of the managing and executive class is not promoted by the uncertainties attending positions in organizations that hire and fire as the accounting books dictate. Salary is not the sole consideration of those selling their services; stability of employment is also valued.

Mergers accentuate personnel turnover. Often men of ability are suddenly let out, sometimes too old to adapt themselves to new positions except at sharp reductions in salary. To add to their difficulties, some corporations have a standing rule against employing men over 45 years of age. The dislocation of personnel attending consolidations has more far-reaching effects. Throughout the merged organization there is wire-pulling by those who look for promotion, and similarly a scurrying for new jobs by those fearing dismissal. The adverse effect on efficiency, although temporary, opens the way for competitive inroads, sometimes deep and lasting, by other companies.

Smaller Organization Has Inherent Advantages

ALTHOUGH the current trend in industry is undeniably toward mergers, it is clear that consolidation is not without disadvantages, nor is it equally well suited to all kinds of business. It is also apparent that the smaller type of organization is still with us and will probably remain. Large corporations are best adapted to the manufacture of staple mass goods, particularly raw materials sold in large unit quantities, and the fields where heavy expenditures must be made for scientific research.

Smaller organizations can best hold their own in the manufacture of specialties. In addition to their advantages in superior incentive, better employee morale and greater customer good will, they are more flexible in management than large companies. They can alter production and get sales campaigns under way to meet new demands

before a more cumbersome organization has finished assembling and digesting departmental reports. In the manufacture of mass products the inflexibility of the large corporation is especially marked. It took an automobile company nearly a year to retool its plants for a change of model.

Production efficiency, also, is not all on the side of the big company. A survey by L. P. Alford, vice-president Ronald Press Co., New York, and J. E. Hannum, mechanical engineer, showed higher production per 1000 man-hours in smaller companies, in many instances, than in larger organizations in the same industry. In 35 industries the smallest company was found to have a higher rate than the largest. The reverse was true in 18 industries.

Obviously the merger is not a cure-all for current business difficulties. For some manufacturers it is highly desirable; for others it may prove detrimental rather than beneficial. In each case of proposed consolidation a careful study should be made of the conditions at hand.

Consolidations and Acquisitions in 1928

January

Empire Steel Corporation, Mansfield, Ohio, a consolidation of Mansfield Sheet & Tin Plate Co., Mansfield; Ashtabula Sheet Steel Co., Ashtabula, Ohio; Empire Steel Co., Cleveland, and Falcon Steel Co., Thomas Sheet Steel Co. and Waddell Steel Co., Niles, Ohio, to make steel sheets and strips.

Gears & Forgings, Inc., Cleveland, a consolidation of Van Dorn & Dutton Co. and Ohio Forge Co., Cleveland; Fawcus Machine Co., Pittsburgh, and William Ganschow Co., Chicago, to make gears, forgings and related products.

Spang, Chalfant & Co., Inc., and Standard Seamless Tube Co., Pittsburgh, merged under name of former to manufacture seamless and welded steel tubing.

Kalman Steel Co., Chicago, acquires Sykes Metal Lath & Roofing Co., Niles, Ohio, maker of metal lath.

Keystone Products Corporation, Kokomo, Ind., merger of Kokomo Brass Works, Byrne, Kingston & Co. and Kokomo Electric Co., all of Kokomo, to make automotive parts and accessories.

Black & Decker Mfg. Co., Towson, Md., acquires Van Dorn Electric Tool Co., Cleveland, to continue manufacture of electric tools.

Continental Can Co., New York, purchases United States Can Co., Norwood, Ohio.

United Engineers & Contractors, Inc., Philadelphia, a consolidation of United Gas Improvement Contracting Co., Philadelphia; Public Service Production Co., Newark, N. J.; Dwight P. Robinson & Co., Inc., New York, and Day & Zimmerman Engineering & Construction Co., Philadelphia, to engage in all forms of engineering and construction activity.

Blaw-Knox Co. and Andrews-Bardshaw Co., Pittsburgh, merged and will produce iron and steel products, buckets, machinery and steam specialties.

Barbour Stockwell Co., Cambridge, Mass., buys Broadway Iron Foundry Co., Cambridge, and will continue manufacture of castings of all kinds.

Wilmarth & Morman Co., Grand Rapids, Mich., and Covel-Hanchett Co., Big Rapids, Mich., formerly Machinery Co. of America, are merged to manufacture grinding and saw and knife-fitting machinery.

Judson Mfg. Co., Emeryville, Cal., and Pacific Rolling Mill Co., San Francisco, merged as Judson-Pacific Co. and will operate rolling mills, open-hearth furnaces and structural steel fabricating plant.

McClintic-Marshall Co., Pittsburgh, buys Central Iron Works, San Francisco, and will operate as a Pacific Coast fabricating unit.

February

Wyckoff Drawn Steel Co., Pittsburgh, acquires Fitzsimons Steel & Iron Co., Chicago, maker of cold-finished steel bars and shafting.

Mid-States Steel & Wire Co., Crawfordsville, Ind., formed by consolidation of Dwiggins Wire Fence Co., Anderson, Ind.; Crawfordsville Wire & Nail Co., Crawfordsville, and Adrian Fence Co., Adrian, Mich., to manufacture wire fence and other wire products.

Standard Steel Car Co., Hammond, Ind., buys Illinois Car & Mfg. Co. with three plants in Chicago district, manufacturing railroad equipment.

Allis-Chalmers Mfg. Co., Milwaukee, buys Monarch Tractor Corporation, Springfield, Ill., tractor maker.

March

Diamond Motor Parts Co., St. Cloud, Minn., takes over Gill Mfg. Co., Chicago, maker of piston rings, and Schlieder Mfg. Co., Detroit, maker of automotive valves.

Truscon Steel Co., Youngstown, buys Hydraulic Steel Co., Cleveland.

Producto Machine Co., Bridgeport, Conn., succeeds Bilton Machine Tool Co., machine tool maker.

National Bearings Metal Corporation, St. Louis, and American Brake Shoe & Foundry Co., New York, are combined to continue manufacture of railroad equipment.

April

Columbus-McKinnon Chain Co., Tonawanda, N. Y., acquires hoist division of Chisholm-Moore Mfg. Co., Cleveland.

Veeder Mfg. Co., Hartford, Conn., and Root Co., Bristol, Conn., are merged as Veeder-Root, Inc., to continue manufacture of calculating machines.

May

Fulton Iron Works, St. Louis, maker of gas engines, is merged with Foos Engine Co., Springfield, Ohio, maker of Diesel engines.

National Electric Products Corporation is formed by merger of National Metal Molding Co., Pittsburgh; American Copper Products Corporation, Bayonne, N. J., and British American Metals Co., Plainfield, N. J., to make electrieal transmission apparatus.

Hydro-Hoist Co., Milwaukee, maker of hydraulic hoists, is consolidated with Heil Co., Milwaukee, maker of steel dump bodies, tanks and stacks.

June

Butterworth & Lowe, Grand Rapids, Mich., makers of saws, purchased by Oliver Machinery Co., Grand Rapids, maker of woodworking machinery and machine tools.

James B. Clow & Sons, Chicago, cast iron pipe makers, purchase controlling interest in National Cast Iron Pipe Co., Birmingham.

July

J. I. Case Threshing Machine Co., Racine, Wis., acquires farm machinery plant of Emerson-Brantingham Co., Rockford, Ill.

American Rolling Mill Co., Middletown, Ohio, buys Ashland Steel Co., Ashland, Ky.

Taylor-Davis, Inc., Philadelphia, is formed by merger of A. Taylor Co. and reinforcing bar department of Davis Brothers, Inc., both of Philadelphia, to operate steel warehouse.

Covel-Hanchett Co., Big Rapids, Mich., maker of grinding and cutting machinery, acquires Badger Tool Co., Beloit, Wis., manufacturer of heavy disk-grinding machines.

August

Republic Iron & Steel Co., Youngstown, acquires Steel & Tubes, Inc., Cleveland, maker of electrically welded steel tubing.

Wrought Iron Co. of America is formed by consolidation of Lebanon Iron Co., Lebanon, Pa., and Scranton Bolt & Nut Co., Scranton, Pa., to manufacture bar iron, bolts, nuts, spikes, etc.

Bridgeport Chain Co., Bridgeport, Conn., maker of weldless wire and flat metal chain, springs and wire specialties, is purchased by Round interests, Cleveland, and name changed to Bridgeport Chain & Mfg. Co.

September

International Combustion Engineering Corporation, New York, purchases Hedges-Walsh-Weidner Boiler Co., Chattanooga, Tenn., maker of tanks, boilers and fabricated steel plate work.

Vanadium Alloys Steel Co., Latrobe,

Pa., acquires Colonial Steel Co., Colona, Pa. Both are makers of tool and high-speed steels.

Joseph T. Ryerson & Son, Inc., Chicago, acquires steel warehouse of E. P. Sanderson Co., Cambridge, Mass.

October

Black & Decker Co., Towson, Md., maker of electric tools, purchases Domestic Electric Co., Cleveland, maker of fractional horse-power motors.

Timken Steel & Tube Co., Canton, Ohio, buys Weldless Tube Co., Wooster, Ohio, maker of cold-drawn seamless tubing.

November

General American Tank Car Corporation, Chicago, acquires Buffalo Car Co., Buffalo, N. Y., car building and repair shop.

Simonds-Worden-White Co., Dayton, Ohio, is formed by merger of A. A. Simonds Co., Dayton; L. & I. J. White Co., Buffalo; R. J. Dowd Knife Works, Beloit, Wis., and Worden Tool Co., Cincinnati, all manufacturers of machine knives.

Continental Can Co., Inc., New York, acquires Wheeling Can Co., Wheeling, W. Va.

Cincinnati Car Co., Cincinnati, merged with Versare Corporation, Albany, N. Y., as Cincinnati Car Corporation, to manufacture interurban and street cars, industrial locomotives and automobile buses.

December

Foote Brothers Gear & Machine Co., Chicago, acquires Bates Mfg. Co., Joliet, Ill., and Lyle Culvert & Road Equipment Co., Stockland Road Machinery Co. and Northwestern Steel & Iron Co., all of Minneapolis, manufacturers of road equipment and machinery

Louis Sacks, Inc., and Barlow Foundry, Inc., both of Newark, N. J., are consolidated as Sacks-Barlow Foundries, Inc., and acquire Morrison Flockhart Foundry Corporation, also of Newark. Company specializes in gray iron castings.

Johns-Manville Corporation, New York, maker of roofing products, purchases Celite Products Co., Los Angeles, manufacturer of insulating materials.

Milwaukee Corrugating Co., Milwaukee, maker of sheet steel building products, purchases Eller Mfg. Co., Canton, Ohio, manufacturer of corrugated steel awnings and kindred products.

Republic Brass Corporation is formed by consolidation of Rome Brass & Copper Co., Rome, N. Y.; Michigan Copper & Brass Co. and Higgens Brass & Mfg. Co., Detroit; Taunton-New Bedford Copper Co., Taunton and New Bedford, Mass.; Dallas Brass & Copper Co., Chicago, and Baltimore sheet mill of General Cable Corporation, to manufacture rolled brass and copper products.

Jaeger Machine Co., Columbus, Ohio, and Lakewood Engineering Co., Cleveland, makers of concrete mixing, handling and placing machinery, are merged.

United Aircraft & Transport Co. by consolidation of Pratt & Whitney Aircraft Corporation, Hartford, Conn.; Chance Vought Corporation, Long Island City, N. Y., and Boeing Airplane & Transport Corporation, Seattle, to manufacture ariplane engines and airplanes and engage in air transportation.

Consolidated Steel Corporation, Los Angeles, formed by consolidation of Llewellyn Iron Works, Baker Iron Works and Union Iron Works, all of Los Angeles, to engage in structural steel fabrication and manufacture elevators and other products.

Borg-Warner Corporation, Chicago, and Galesburg Coulter-Disc Co., Galesburg, Ill., manufacturers of automobile and agricultural implement parts, to be merged.

Duff-Norton Mfg. Co., Pittsburgh, organized as merger of Duff Mfg. Co., Pittsburgh, and A. O. Norton, Inc., Moline, Ill., manufacturers of industrial and railroad jacks and drop forgings.

Unit Corporation of America, Milwaukee, acquires Brown-Lipe Gear Co., Syracuse, N. Y., maker of transmission units for automobiles, trucks and tractors.

Bemis & Call Hardware & Tool Co., Springfield, Mass., buys Coes Wrench Co., Worcester, Mass. Both are manufacturers of monkey wrenches and combination wrenches.

Niles Tool Works Co. and Hoover, Owens, Rentschler Co., Hamilton, Ohio, both makers of heavy machinery of many kinds, are consolidated as General Machinery Corporation.

Centrifugal Pipe Output Increases

Estimated Decline in Total Cast Pipe Tonnage Attributed to Growing Demand for Lighter Sections—Imports Smaller

ANOTHER year of only moderately satisfactory business has been experienced in cast iron gas and water pipe during 1928. Output may have equaled the 1927 total of 1,488,644 tons, but is not believed to have exceeded it, so that total production of all makers, which climbed from 564,138 net tons in 1921 to a peak of 1,534,278 tons in 1926, may have registered a further decline. Steadily increasing output of centrifugally cast pipe, however, has introduced a factor in this field, which alters the conclusion that there is a diminished demand for cast iron pipe. Centrifugal pipe output represents a larger percentage of the total production for the year than ever before, with close to 425,000 tons estimated to have been made under the sand spun and De Lavaud processes. This compares with an estimated centrifugal output of 400,000 tons in 1927 and about 200,000 tons in 1926. As this pipe is for the most part relatively thin-walled and about two-thirds the weight of sand cast pipe, it is probable that despite a smaller tonnage of pipe produced in 1928, a greater mileage has been sold than in any previous year.

Output of centrifugal pipe was increased during the year by steady operation of two of the six manufacturers participating in rights to the sand spun pipe patents, the American Cast Iron Pipe Co., Birmingham, and R. D. Wood & Co., Florence, N. J. Recently the Warren Foundry & Pipe Co., Phillipsburg, N. J., a part owner, but not yet a producer under these patents, has been negotiating with a furnace interest at Everett, Mass., to establish, close to the blast furnace, a centrifugal plant for small sizes of pipe. In 1929 this production may add to the present sand spun output, the proposed plant serving the New England market on low freight rates from the Boston district. And then again, the American Radiator Co., now about to produce cast iron pipe on a large scale, particularly in small diameters for use in buildings, may be a factor.

Imports Declined

European cast iron pipe has been a factor of declining importance, both on the Atlantic and Pacific coasts, the French interest, Société Anonyme des Hauts-Fourneaux et Fonderies de Pont-a-Mousson, not appearing in competition to any extent in the second half of the year until it secured a contract for 14,000 tons of pipe for Warwick, R. I., toward the end of October. On the Pacific Coast a Belgian pipe interest was an active seller of small lots during the year, but the total sold was not large. Imports, which totaled 83,873 tons in 1926 and 81,764 tons in 1927, are estimated at not more than 65,000 tons in the 12 months of this year. Domestic makers, however, are seeking an increase in the tariff and are expected to appear at the tariff

hearing in January to advocate either a considerable increase in the present ad valorem duty or the application of a high specific duty on pipe.

In foreign markets, Continental makers, both French and German, have secured the greater part of the business which has developed, even when the buyers were American contractors or exporters. Some sizable tonnages of cast iron pipe were bought during the year for Colombia, Peru, Venezuela, Bolivia and Argentina and small lots appeared in the market for Cuba, Dutch East Indies, Philippine Islands, Haiti and China. A few of the small tonnages were booked by Birmingham pipe makers.

Southern Makers Less Active in North

Unlike 1927, when prices of cast iron pipe fluctuated over a $10 a ton range, the market this year has been maintained at a fairly steady level, with only a moderate amount of change. A feature has been the gradual recession of Southern competition in the Northern market. Throughout 1927, Birmingham producers had been keen competitors for tonnage in the North and their quotations had provided the basis for prices, Northern plants meeting the Birmingham base, plus the freight rate to the North, which, in the case of shipments to the New York district, was $9.25 per net ton. By the middle of May Southern foundries had advanced their prices to a basis of $31 to $33, Birmingham, or $40.25 to $42.25, delivered New York, and Northern makers were once more able to establish their local market prices, advancing quotations to $36 per net ton, foundry, or with a $2.60 freight rate to New York, $38.60 per net ton, delivered. By the end of the year Birmingham prices had been increased to $36 to $38 per ton, f.o.b., and Northern plants were quoting $36 to $38, f.o.b. plant.

Buying throughout the year was limited to smaller tonnages than in 1927, except for the usual private company contracts on gas pipe for spring delivery, placed late in the fall. The election is believed to have contributed in part to inaction by municipalities in the second half, as in a number of cities bond issues were presented to the voters for approval.

Municipalities, which have been listed among the heavy buyers of cast iron pipe in past years, have taken only a part of their usual requirements. Detroit and New York, outstanding buyers in 1927, with about 25,000 tons each, have closed on about 17,000 tons each this year. Chicago has placed orders for only about 10,000 tons. On the Pacific Coast there was active buying of small lots. Dallas, Tex., probably ranks first among the year's large municipal purchasers of pipe with a total of close to 40,000 tons.

As the year ends, makers are bidding on a substantial tonnage of gas pipe for spring delivery to private companies and among large requirements in prospect for 1929 is all, or the greater part of, about 50,000 tons of water pipe to be bought by Albany, N. Y., for an extensive water project.

Heavy Steel Buying Follows Rationalization of Oil Industry

BY WILLIAM GRETZINGER*

PRODUCTION control, a policy successfully launched in 1928 by the petroleum industry, points to an increased but relatively stabilized market for line pipe, casing and drill pipe during the coming 12 months. The past year has seen the first effective efforts to rationalize the oil industry, similar in many respects to measures taken by copper producers. Controlled output of petroleum in Oklahoma, Texas and California, and also in Venezuela, with a corresponding rise in price, was reflected in a sharp increase in oil company earnings.

For the first nine months of 1928 these earnings were approximately 42 per cent greater than for the same period last year. Improved conditions, first noticeable in oil company earnings, have been reflected more recently in increased orders for tubular goods and other oil field equipment. One of the large oil country supply houses has estimated its earnings for the last six months of 1928 at $8.30 a share, against $1.63 for the first six months of the year.

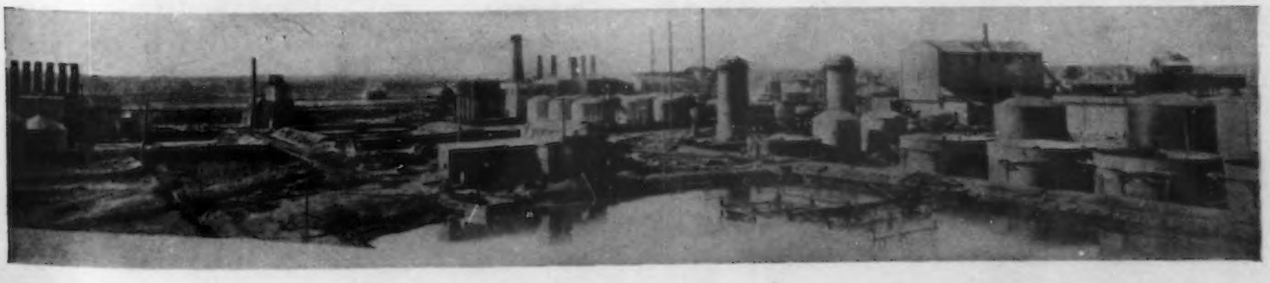
Recent reports of new pipe lines to be laid indicate that approximately 375,000 tons of line pipe will be required during the next several months, and this at a time of year when the pipe mills are normally in need of any extra business they can get.

The position of the producing branch of the oil industry is closely related to the amount of petroleum in storage. Total stocks are somewhat higher today than last year at this time, but the favorable effects of production control were shown in sharp reductions in August and September. During August, 1928, total stocks of all oils decreased 2,458,000 bbl., the largest decline since September, 1926. In September, 1928, total stocks decreased 2,421,000 bbl., compared with a gain of 1,521,000 bbl. in September, 1927. While there was a recovery in October, 1928, it was comparatively small, amounting to only 226,000 bbl. Increased production during that month was obtained chiefly from Oklahoma. The output of Texas, which ranked second in production, showed a small increase following new discoveries in the Gulf Coast area. Production in California, which ranked third, registered a small decline as a result of retarded development work in the new deep zone at Santa Fe Springs.

That the petroleum industry, as a whole, is at last beginning to realize that rationalization, or fitting supply to demand, is the only way out of the alternate periods of overproduction and undersupply, was indicated in a very positive way at the last meeting of the American Petroleum Institute, held in Chicago early in December.

A "committee of nine," representing the Government, the American Bar Association and the petroleum industry, is now working on a plan to place agreements for conservation of petroleum and control of production definitely outside the scope of the anti-trust laws.

*Editor *Oil Field Engineering*, Philadelphia.



World Iron and Steel Output at New Heights Last Year

American Steel Production Was 48 Per Cent of World Total of 107½ Million Tons—Pig Iron Was 86 Million—No Increase in World Exports

NEW records were again made by the world's iron and steel industry in 1928. The expansion in steel was considerably larger than in pig iron. For 21 countries steel production, at 107,490,000 gross tons, was about 7.3 per cent in excess of the 100,180,000 tons made in 1927, the first time that the 100,000,000-mark was passed. Pig iron at 86,230,000 tons was only a little over 1 per cent in excess of the 85,270,000 tons in 1927.

American output is the feature of last year's expansion—the steel total was 48 per cent of the world total as against 44.8 per cent in 1927.

Exports of the leading nations, according to estimates, were about the same as in 1927.

Greater World Steel Output Due to American Increase

LARGE expansion in steel ingot production by the American steel industry was outstanding in the 1928 world steel history. This is the explanation of the increase of the world total over that of 1927.

Based on data published, or furnished by cable, by the National Federation of Iron and Steel Manufacturers, of London, England, as given in detail in the accompanying tables, the pig iron and steel production of the world, covering 21 countries, surpassed all previous records.

With estimates for the last month or two for the leading producing countries, the world's pig iron output was about 86,230,000 gross tons, an increase of about 1.1 per cent over the 85,270,000 tons of 1927—the revised data. It was 10.95 per cent more than the 77,720,000 tons made in 1913 and exceeded the latter for the second time.

A new world record was easily made in steel production—approximately 107,490,000 tons. This is about 7.3 per cent larger than the 100,180,000 tons (revised data) produced in 1927. The fact that the 1928 steel output is about 43 per cent in excess of the 74,830,000 tons made in 1913 impressively demonstrates the strides made since the war.

Records of American Steel Impressive

American records in steel last year are striking. At approximately 51,650,000 tons for ingots and castings, the 50,000,000-mark was exceeded for the first time. Last year's total was about 48 per cent of the world total as contrasted with 44.8 per cent in 1927. In pig iron the American total last year of 38,000,000 tons was 35.1 per cent of the world total, or more than the record in 1927, which was 42.3 per cent of the total. The 1928 production was 4 per cent larger than in 1927. A more comprehensive discussion of the American production is found on other pages.

European Output About Holds Its Own

Analyzing the European production last year, there was nothing particularly noteworthy. Volume of both steel

Table of World Production of Pig Iron in Millions of Gross Tons

Country	1913	1924	1925	1926	1927	1928*
United Kingdom	10.26	7.31	6.26	2.46	7.29	6.60
Germany	16.50	7.68	10.01	9.50	12.90	11.44
France	5.13	7.57	8.36	9.28	9.15	9.86
Belgium	2.45	2.80	2.50	3.35	3.69	3.79
Luxemburg	2.51	2.12	2.33	2.52	2.69	2.70
Saar	...	1.37	1.43	1.61	1.74	1.89
Russia	4.49	0.74	1.53	2.40	2.92	3.23
Poland	...	0.33	0.31	0.32	0.61	0.67
Norway	...	0.06	0.08	0.08	0.08	0.08
Sweden	0.73	0.53	0.45	0.49	0.41	0.35
Italy	0.43	0.34	0.50	0.50	0.53	0.50
Austria	2.34	0.26	0.37	0.37	0.43	0.45
Hungary		0.11	0.09	0.19	0.29	0.28
Czechoslovakia		0.97	1.28	1.07	1.24	1.51
Spain	0.42	0.49	0.46	0.50	0.60	0.61
United States	30.97	31.41	36.70	39.37	36.57	38.00
Canada	1.01	0.62	0.60	0.80	0.77	1.06
Australia	0.04	0.42	0.44	0.40	0.55	0.42
India	0.20	0.88	0.89	0.90	1.15	1.01
Japan	0.24	0.82	0.91	1.16	1.26	1.38
China	...	0.37	0.38	0.40	0.40	0.40
Total	77.72	67.20	75.88	77.67	85.27	86.23

*Partly estimated. Lorraine's output is included in Germany's in 1913, but in that of France since 1918.

Table of World Production of Steel Ingots and Castings in Millions of Gross Tons

Country	1913	1924	1925	1926	1927	1928*
United Kingdom	7.66	8.20	7.39	3.60	9.10	8.59
Germany	17.33	9.68	12.00	12.15	16.06	13.96
France	4.61	6.79	7.33	8.30	8.14	9.25
Belgium	2.43	2.83	2.51	3.32	3.66	3.87
Luxemburg	1.31	1.86	2.05	2.21	2.43	2.51
Saar	...	1.45	1.55	1.71	1.86	2.05
Russia	4.76	1.12	2.11	3.08	3.53	4.10
Poland	...	0.67	0.77	0.78	1.23	1.28
Sweden	0.58	0.49	0.47	0.49	0.49	0.53
Spain	0.30	0.53	0.57	0.68	0.65	0.69
Austria	2.59	0.37	0.46	0.35	0.55	0.63
Hungary		0.24	0.23	0.20	0.46	0.47
Czechoslovakia		1.33	1.48	1.55	1.60	1.80
Italy	0.92	1.34	1.76	1.75	1.57	1.95
United States	31.30	37.93	45.39	48.29	44.94	51.65
Canada	1.04	0.66	0.76	0.78	0.92	1.24
Australia	...	0.31	0.35	0.35	0.52	0.50
India	...	0.34	0.45	0.52	0.57	0.44
Japan	...	1.11	1.32	1.48	1.70	1.68
China	...	0.20	0.20	0.20	0.20	0.30
Total	74.83	77.45	89.15	91.79	100.18	107.49

*Partly estimated. Lorraine's output is included in Germany's in 1913, but in that of France since 1918.

and pig iron fell off in Great Britain and Germany (due to a strike late in the year), while that of France, Belgium and Luxemburg expanded, but not greatly. Although both pig iron and steel production in Europe last year exceeded the 1927 records, its proportion of the total world output fell. It was 48 per cent of the world total last year and 48.8 per cent in 1927. In pig iron, the 1928 European output of 43,960,000 tons was 50.9 per cent of the world total, while in 1927 the 44,570,000 tons made was 52.2 per cent of the total.

Mention should be made of the rapid recovery of Russia in both pig iron and steel. Over 4,100,000 tons of steel is the probable 1928 record, as against 3,530,000 tons in 1927. In pig iron last year the output of 3,230,000 tons contrasts with 2,920,000 tons in 1927. Last year's performance, however, still falls short of the pre-war or 1913 production.

Table of Steel Exports and Imports of Leading Countries in Millions of Gross Tons

Exports	1913	1925	1926	1927	1928*
United States	2.89	1.68	2.06	1.94	2.40
Great Britain	4.97	3.73	2.99	4.20	4.28
Germany	6.20	3.21	4.82	4.23	4.88
France	0.58	3.86	4.13	5.60	4.94
Belgium	1.55	3.15	3.71	4.61	4.00
Total	16.19	15.63	17.71	20.58	20.50
Imports	**1913**	**1925**	**1926**	**1927**	**1928***
United States	0.25	0.84	1.02	0.69	0.70
Great Britain	2.23	2.72	3.74	4.41	2.94
Germany	0.30	1.18	1.03	2.23	2.07
France	0.17	0.17	0.18	0.13	0.13
Belgium	0.87	0.53	0.60	0.64	0.76
Total	3.82	5.44	6.57	8.10	6.60
Export excess	12.37	10.19	11.14	12.48	13.90

*Partly estimated. Luxemburg included in Belgian total. Scrap not included in these data.

World Consuming More Steel, Exports Indicate

WORLD consumption of steel, as judged by the exports of the six principal exporting nations, did not expand in 1928. Estimates make the combined exports of these nations 20,500,000 tons in 1928, but final returns may increase this total. At the best, however, it is not likely to exceed very much the 20,580,000 tons of 1927.

Imports into these six countries fell off decidedly last year. The estimated total, as shown by the table, was 6,600,000 tons, as contrasted with 8,100,000 tons in 1927. This is a decrease of 18.5 per cent. Scrap is not included in the export or import data. American and British exports of scrap exceeded all recent records.

Last year's significant feature was a further increase in the excess of exports over imports. For 1928 this excess was 13,900,000 tons, as against 12,480,000 tons in 1927. It again is greater, as in 1927, than the export excess in 1913 of 12,370,000 tons, but by a larger margin this year. Probably this indicates that the world's consumption of steel, particularly that of the non-producing nations, has more nearly reached normal proportions. In 1925 the export excess was 10,190,000 tons.

Again France leads in total exports—4,940,000 tons last year, or nearly 25 per cent of the total. Germany is a close second at 4,880,000 tons. France's present exports are nearly five-fold those of 1913, but Germany has not yet attained the pre-war volume. A substantial increase is recorded in American exports this year—2,400,000 tons, or the largest since the war.

In imports the outstanding feature is the sharp decline in the German and British volume last year.

Canadian Industry Forges Ahead

Iron and Steel Output Greatest Since the War—Automobile, Agricultural Implement and Building Lines Have Active Year

TORONTO, ONT., Jan. 1.—Canada not only maintained her place as the best customer of the United States, but during 1928 her own industry forged ahead to a position which emphasized the growing importance of the Dominion's production of goods. While all lines shared in the betterment, it was more pronounced in the iron and steel industry than in any other. It is quite evident that the Canadian iron and steel industry has passed from the reconstruction period and post-war depression to one of steady growth and improvement.

Not only was 1928 the best year since 1920, but for many in the iron and steel and allied industries it was the best peace-time year that this country has ever known. A continuance of good business is predicted for 1929, while some go so far as to look for a condition of prosperity for several years.

The activity of the automotive industry was one of the main factors in stimulating business in the iron and steel industry. Motor car and truck production in Canada for 1928 was the greatest in the history of this industry. Production of motor vehicles during the first 10 months of 1928 exceeded the output for all of 1927, and there was little or no curtailment during the last two months.

Building and bridge construction work was also a factor that led to betterment in the iron and steel industry. While the greater part of the structural steel used in building and bridge construction was imported from the United States, auxiliary lines produced entirely in Canadian plants, such as sanitary ware and radiator supplies, builders' hardware, electrical equipment, etc., all of which were able to report record breaking plant operations for the year.

Changes of Control in Iron and Steel Industry

IN the iron and steel industry several changes of interest occurred. Outstanding was the passing of control of the Lake Superior Corporation and its subsidiaries, including the Algoma Steel Corporation at Sault Ste. Marie, Ont., from the hands of United States interests into that of a Canadian syndicate headed by Robert Dodd. Another change was the acquiring of the British Empire Steel Corporation group of industries, including the Dominion Iron & Steel Co., Sydney, N. S., by Holt, Gundy & Co., from the control of Roy M. Wolvin and his associates. In addition, there were a number of amalgamations and changes in control of various smaller steel plants, foundries, structural steel fabrication plants, etc.

The transfer of the controlling interest in the Lake Superior Corporation brought with it an announcement from President Dodd that his company was prepared to spend $12,000,000 in the next few years on plant improvement and extensions. During the past year upward

of $500,000 was expended on the Algoma works at Sault Ste. Marie, Ont., including the installation of a benzol plant at the by-products coke ovens at a cost of $300,000, and the company is now shipping benzol as motor fuel at the rate of 4500 gal. per day.

The Algoma Steel Corporation experienced its best year since 1920. Rail mill operations in 1928 were nearer to capacity than in any calendar year since the war, and the production of rails amounted to about 220,000 gross tons, which was more than double the rail output for 1927. Last year was the first since the war that the company was successful in securing enough rail business to keep its mill in continuous operation.

While the Dominion Iron & Steel Co., Sydney, N. S., was taken over by the Holt-Gundy interests, it continued throughout the year under the management of the National Trust Corporation, which took charge at the time it went into the hands of receivers a couple of years ago. This company also experienced its best year since the war. The rail mill was in continuous operation, and the company still has enough rail business to keep its mill running for two or three months. Included in the 1928 business received by the Dominion Iron & Steel Co. were two orders from the New York Central totaling about 25,000 tons of 127-lb. rails. These were the first the company ever received from that source, and it was the first time 127-lb. rails had been rolled in Canada.

The various other departments of the Sydney works, including the blast furnaces, open-hearth furnaces, rod mills, wire mills, etc., also maintained operations on a correspondingly high scale. The plant is still running almost to capacity and in some departments is booked up two or three months. To meet the growing demand for its products, both for domestic consumption and export, the company has spent liberally on plant improvements and extensions.

The Steel Co. of Canada, Ltd., Hamilton, Ont., likewise reports an exceptionally good year. The various plants of the company maintained almost capacity operations. President Ross H. McMaster recently announced a development program for the Hamilton plant, calling for an expenditure of $6,000,000 to $7,000,000, funds for which are available in the company's investment account. The company will extend its open-hearth installation and replace the 14-in. and 10-in. rolling mills and make additional expenditures on blooming mills, etc. Arrangements are being completed for an early start on the various expansions.

Foundries, agricultural implement plants and makers of sanitary ware and radiators, experienced one of the best years since the post-war depression. Foundry operations throughout 1927 averaged between 50 and 60 per cent, whereas in 1928 they increased to between 80 and 90 per cent. The record crop yield in the Canadian West had a stimulating effect on the manufacture and sale of agricultural implements. Expenditure by farmers for implements was on a more extensive scale during the last two or three months of the year, and in most instances the farmers had the cash with which to make purchases.

United States Shared in Expansion of Canadian Business

THE improvement in industrial activities was reflected in a greatly improved demand for raw materials. Sales of foundry and malleable pig iron increased approximately 35 per cent over those of 1927, but prices did not reflect the improved demand. Strong efforts have been made by Canadian producers to boost prices, but despite the fact that the Buffalo quotation is substantially higher than the Toronto quotation, and the demand for iron has been steadily improving, these efforts have been unavailing.

While the consumption of iron and steel in Canada reached new peace-year records, the Canadian producers of these commodities did not reap all the benefit; the United States shared to no small degree. Imports of iron and steel and their products from the United States reached new high levels. For the first six months of the year Canadian producers of iron and steel experienced strong competition in the home market, especially from United States agents. The last six months, however, which brought higher prices across the international boundary, tended to curtail their activities in the Canadian market, and toward the latter part of the year most of the imports were confined to such lines as were not produced here, or made only in small quantities. In pig iron, United States producers secured a large volume of business up to the end of July from consumers other than those engaged in the agricultural implement industry, but during the last half of the year United States prices began an upward movement, while Canadian prices remained unchanged, with the result that the local price was approximately $1 per ton under the quotation of its neighboring competitor. The agricultural implement industry, which enjoys duty free iron, continued to import practically all the pig iron used in its plants. During the first nine months of the year, pig iron imported by Canada from all countries totaled 37,098 gross tons, compared with 32,940 tons in the corresponding nine months of 1927.

Production of Iron and Steel in Canada

(Gross Tons)

Year	Pig Iron	Ferro-alloys	Steel Ingots	Steel Castings
1923....	880,018	28,961	839,710	45,060
1924....	593,024	26,400	625,175	25,515
1925....	570,397	25,709	733,855	18,840
1926....	737,503	57,416	743,550	33,338
1927....	709,697	56,514	867,928	39,710
1928....	1,029,585	43,573	1,201,477	42,783

Of this total, 32,646 tons was from the United States, against 27,887 tons in 1927, the remainder having come from Great Britain.

Output of Iron and Steel at Highest Monthly Rate Since War

MOST of the increased consumption of pig iron was taken care of by Canadian producers. Throughout the year at least seven blast furnaces were blowing and on occasions this number was increased to eight. The year was the first since the war that the iron and steel industry of Canada was able to make use of the output from eight blast furnaces. By far the greatest part of the pig iron output during the year consisted of basic iron which was produced for the further use of reporting firms. Foundry and malleable grades, however, also accounted for a good share of the increased production.

The output of steel ingots and castings kept pace, showing an advance of 40 per cent over the figures of 1927. The greatest improvement was in steel ingots.

Canada's production of iron and steel throughout all of 1928 was at a higher monthly rate than the average for any year since the war, but it was still much below the total capacity of Canadian plants, and it fell below the high record of 1918, which was 1,622,000 tons.

"Ideal" Alloy Steel for Structures

"Chromol steel" is the name given to a steel proposed in 1920 by J. A. L. Waddell, a well-known American bridge engineer, and recommended by him as "an ideal structural material." The composition which he most highly recommended was:

Carbon	0.25 per cent
Manganese	0.75 per cent
Chromium	0.75 per cent
Molybdenum	0.75 per cent

Considerable New Capacity in 1928

Ten New Open-Hearth Furnaces Add 830,000 Tons—Two New Blast Furnaces Blown In—Expansion This Year, Nine Open-Hearths and One Blast Furnace

SUBSTANTIAL additions to both steel-making and blast furnace capacity were made last year or are under way for this year. They easily exceed 1927. Important facts regarding new construction and equipment completed in 1928 or planned for completion in 1929 have been furnished by companies having blast furnaces, steel plants and rolling mills, as well as some foundries. A summary of the data follows:

Open-Hearth Capacity Added in 1928

Expansion in open-hearth capacity in 1928 was much larger than our analysis a year ago indicated. Only two furnaces were reported as scheduled for building during 1928 but 10 were completed.

The 1928 additions of 10 furnaces have an estimated capacity of 815,000 gross tons per year. This compares with 630,000 tons in 1927. Last year's expansion was the largest since 1926 and the third largest since the war. The post-war peak was 875,000 tons for 19 furnaces in 1923. In 1927 the total was 630,000 tons for 12 new furnaces. The war peak was 4,205,000 tons for 103 new furnaces in 1916.

Additions to open-hearth capacity in 1928 were made by the following companies:

Wisconsin Steel Co., Chicago, two 100-ton furnaces; Interstate Iron & Steel Co., Chicago, one 100-ton furnace; Weirton Steel Co., Weirton, W. Va., one 250-ton furnace; Timken Steel & Tube Co., Canton, Ohio, two 100-ton furnaces; Otis Steel Co., Cleveland, three 150-ton furnaces, and the Continental Steel Corporation, Kokomo, Ind., one 100-ton furnace.

New Furnaces Planned for 1929

Plans call for the erection of nine open-hearth furnaces in 1929. The estimated capacity of the nine furnaces is 630,000 tons.

Expansion to open-hearth capacity in 1929 is to be made by the following companies:

Interstate Iron & Steel Co., Chicago, one 100-ton furnace; Youngstown Sheet & Tube Co., Indiana Harbor (Chicago) plant, three 150-ton furnaces; Ford Motor Co., Detroit, three 100-ton furnaces; Laclede Steel Co., St. Louis, one 100-ton furnace, and the Continental Steel Corporation, Kokomo, Ind., one 100-ton furnace.

Several companies have rebuilt or enlarged the capacity of their open-hearth furnaces. Prominent among these is the rebuilding of four furnaces by the Carnegie Steel Co., at its Edgar Thomson works, 10 at the South Works of the Illinois Steel Co., Chicago, and four at the Donora, Pa., plant of the American Steel & Wire Co.

Two Blast Furnaces Added Last Year

Two blast furnaces, which were scheduled for completion in 1928, were finished and blown in. They are the two 650-ton furnaces at the Fairfield, Ala., plant of the Tennessee Coal, Iron & Railroad Co., having an annual capacity of about 475,000 tons. In 1927 no new furnaces were built, duplicating conditions in 1923. Since the war the largest years have been 1920 and 1926 when six furnaces were completed in each year, having a capacity respectively of 875,000 tons and 1,255,000 tons.

The record since the war has been 21 new blast furnaces: Two in 1919; six in 1920; one in 1921; two in 1922; none in 1923; one in 1924; one in 1925; six in 1926; none in 1927, and two in 1928. For any peace year the record for new blast furnaces completed was nine in 1912 with the war record at 14 in 1917.

Blast Furnace Expansion in 1929

Only one furnace is announced as under construction for possible completion this year. It is a 1000-ton furnace for the Federal Furnace Co., Chicago, with an estimated capacity of 350,000 to 365,000 tons annually. Unannounced but understood to be in prospect are two other large stacks for steel-making companies in the Chicago district.

Several Furnaces Rebuilt or Enlarged

Rebuilding or enlarging of existing furnaces has loomed quite large the past year and the increase in capacity from this cause has been considerable. The

Additions to Open-Hearth Capacity Since the War

Year	Annual Capacity, Gross Tons	Year	Annual Capacity, Gross Tons
1919	625,000	1924	375,000
1920	675,000	1925	585,000
1921	247,500	1926	865,000
1922	227,500	1927	630,000
1923	875,000	1928	815,000

Increase in Open-Hearth Furnaces and Capacity in Gross Tons

Completed in 1928:	Furnaces	Capacity
Independent companies	10	815,000
United States Steel Corporation	0*	.....
Total	10	815,000
Projected for 1929:		
Independent companies	9	630,000
United States Steel Corporation	0	.....
Total	2	630,000

*Rebuilt or enlarged 14 furnaces.

United States Steel Corporation, as given in detail in the first portion of this analysis, has rebuilt or is rebuilding five of its furnaces at five of its plants: Edgar Thomson No. 1, Ohio furnace No. 2, South Works No. 10, Gary No. 11 and Lorain No. 5. The Bethlehem Steel Co. replaced with new stacks its B furnace at its Steelton plant and its A and B furnaces at its Maryland plant. Among other companies remodeling or rebuilding stacks this and last year are the Youngstown Sheet & Tube Co., the Republic Iron & Steel Co., the Gulf States Steel Co., the Toledo Furnace Co. and the Hanna Furnace Co.

During last year 23 furnaces were abandoned which, with the two new Fairfield furnaces blown in, makes a net loss of 21, leaving 336 possibly active on Jan. 1, 1929.

No detailed analysis is made this year of additions to electric furnace steel-making capacity.

The chief features of the reports of the various companies covering new construction completed or planned follow:

The Steel Corporation

NEW construction and improvements completed during 1928 and under way as at Jan. 1, 1929, by subsidiary manufacturing companies of United States Steel Corporation, are as follows:

Carnegie Steel Co.

Completed

Edgar Thomson Works: Turboblower equipment for two blast furnaces, replacing obsolete steam engine equipment; 15,000-kw. turbogenerator and auxiliary equipment in power station, and 4 open-hearth furnaces rebuilt.

Duquesne Works: Remodeling feed water softening plant.

Homestead Works: Beam straightening press and tables at 52-in. Carnegie beam mill.

Carrie Furnaces: New gas washing plant at blast furnaces Nos. 6 and 7.

Ohio Works: Two 1500-ton hot metal mixers.

Mingo Works: New gas washing plant at blast furnace No. 4.

Farrell Works: Modernizing rolling mill facilities and power generating equipment, including 24-in. roughing mill and 6000-kw. a. c. turbogenerator; and turbo blowing equipment for one blast furnace.

Clairton Works: Addition to by-product coke plant of four batteries, 87 19-ton ovens each, with tar and ammonium sulphate recovery, benzol plant and gas booster station and auxiliary facilities, and a tar distillation plant.

The construction was completed of a high tension electric power transmission line, with necessary sub-stations, to "tie in" Edgar Thomson Works, Duquesne Works, Carrie Furnaces, the by-product coke plant at Clairton and National Works of National Tube Co.

Under Way

Edgar Thomson Works: Modernizing blast furnace I and hot blast stoves, new turboblower and additions to stock yard storage and handling facilities.

Duquesne Works: New central boiler plant at blast furnaces.

Ohio Works: Rebuilding blast furnace No. 2.

McDonald Mills: A 10-in. continuous hoop mill and slack barrel hoop shop.

Clairton Works: Gas washer and improvements to blast furnace No. 1, and rebuilding blast furnace No. 2.

Illinois Steel Co.

Completed

South Works: Rebuilding blast furnace No. 10; enlarging 10 furnaces at No. 2 open-hearth plant and modernizing auxiliary facilities.

Joliet Works: New boiler plant.

Gary Works: Additional 30,000-kw. steam turboelectric generating unit in power station; pickling and oiling facilities for merchant mill products, and improved gas washing equipment at blast furnaces Nos. 11 and 12.

Under Way

South Works: Remodeling 8 hot blast stoves at blast furnaces Nos. 5 and 6; two 6000-kw. gas engine-driven electric generating unit additions to No. 1 power station, and equipping north end structural mills with electric drives, replacing steam power.

Joliet Works: New trestle and stock bins at blast furnaces Nos. 3 and 4.

Gary Works: Rebuilding blast furnace No. 11 and enlarging 4 hot blast stoves.

National Tube Co.

Completed

National Works: Finishing equipment for conduit pipe, ¾ in. and larger in butt weld mill.

Lorain Works: New 32-in. mill for rolling rounds at No. 3 blooming mill; converting No. 3 lap weld mill into a seamless mill; 15,000-kw. steam turbine-driven generator and auxiliaries, and extension to blast furnace boiler plant, including three 2500-hp. boilers.

Ellwood Works: Equipping No. 2 piercing and rolling mill with electric drive.

Under Way

National Works: New roll stands and electric drive for finishing end of 13-in. continuous mill.

Lorain Works: Improvements to blast furnace No. 5.

American Steel & Wire Co.

Completed

Newburgh Wire Works: Improvements in cold finished bar department, and new building and equipment for cleaning flat strips and bars.

Central Furnaces and Docks: Crane for pig casting machine.

Anderson Works: Addition of electric welded fabric department.

Waukegan Works: Copper wire-drawing equipment.

New Haven Works: New rod handling and storage system.

Worcester, South Works: Modernizing No. 2 rod mill.

Worcester, Electric Cable: Equipment for manufacturing copper strand.

Donora Steel Works: Four open-hearth furnaces rebuilt.

Donora Zinc Works: Zinc oxide plant.

Under Way

Newburgh Steel Works: New cooling beds for 35-in. blooming mill.

Cuyahoga Works: New rolling mills for large rounds and narrow strips.

Allentown Works: Rebuilding cleaning house and baker.

Trenton Works: Rod storage building and handling system.

Worcester, South Works: Improved copper wire-drawing and annealing equipment.

Donora Steel Works: New stock bins and improvements to ore handling system at blast furnaces.

American Sheet & Tin Plate Co.

Completed

Gary Tin Mill: Enlargement of plant including installation of new motor-driven continuous mill and auxiliary facilities, increasing finishing capacity, and new water intake and pumping station.

Shenango Works: Electric sub-station and 1500-kw. motor generator set.

National Works: Two motor generator sets, replacing steam-driven equipment.

Mercer Works: Normalizing furnace and extending warehouse and pickling buildings.

Under Way

Vandergrift Works: Normalizing furnace, new warehouse building and improvements in annealing department.

Laughlin Works: Extending boiler house, two 723-hp. boilers and auxiliary equipment and a 500-kw. turbine generator.

American Bridge Co.

Under Way

At the plants at Ambridge, Pa., and Gary, Ind., buildings are being erected and shop equipment installed for fabricating the new C. B. column sections.

Tennessee Coal, Iron & Railroad Co.

Completed

Fairfield Works: Two new blast furnaces Nos. 5 and 6 and auxiliary facilities; electric power plant of two 25,000-kw. turbogenerators, and addition to by-product coke plant of battery of 63 18-ton coke ovens.

Under Way

Fairfield Works: A 10-in. cotton tie and hoop mill; converting jobbing mill into 2 sheet mills, and continuous reheating furnace and building for combination bar and structural mill.

Bethlehem Steel Corporation

SUBSIDIARY companies of Bethlehem Steel Corporation report the following principal improvements and additions completed in 1928 and under way at the close of the year.

Bethlehem Steel Co.

Completed

Steelton Plant, Steelton, Pa.: Coke wharf and screening station at coke ovens; new stack to replace "B" blast furnace stack, and two waste heat boilers and four gas producers at the open-hearth department.

Maryland Plant, Sparrows Point, Md.: Two turboblowers with boiler equipment; new stack to replace present "A" blast furnace stack; two hot blast stoves for blast furnaces "B" and "C"; two rows of soaking pits, and two lap weld pipe mills.

Lackawanna Plant, Lackawanna, N. Y.: Two waste heat boilers at open-hearth No. 1; ingot strippers at open-hearth and Bessemer departments; new rail blooming and roughing mills replacing former mill and a 72-in. cold saw at shipping yard.

Cambria Plant, Johnstown, Pa.: Three two-strand pig casting machines; two waste heat boilers at Franklin open-hearth plant, and improvements and additions to mold yard at Franklin open-hearth plant.

Under Way

Lebanon Plant, Lebanon, Pa.: Coal storage and pulverizing plant.

Maryland Plant, Sparrows Point, Md.: New stack to replace present "B" blast furnace stack; hot blast stove for blast furnace "D"; extension to mixer building at No. 1 open-hearth plant, and addition to warehouse at tin plate department.

Lackawanna Plant, Lackawanna, N. Y.: Five Bethlehem gas driven blowing engines with gas washing equipment; gas washers at "F" and "G blast furnaces; two ore and coal unloaders at ore dock and extension of coal storage facilities; three waste heat boilers at open-hearth No. 1, and beam and column shop.

Cambria Plant, Johnstown, Pa.: Water treatment plant for Franklin Division.

Limestone Properties

Completed

Naginey Quarry, Naginey, Pa.: New crushing and screening plant.

Under Way

Steelton Quarry, Steelton, Pa.: Washing plant, and new crushing, screening and washing plant.

Youngstown Sheet & Tube Co.

THE Youngstown Sheet & Tube Co., Youngstown, completed during 1928, at its various plants, the following construction work:

Campbell Works

Blast Furnace Plant: Installation of three 60,000-cu. ft. turboblowers, 400-lb. steam pressure, and remodeling of the top of "D" furnace.

Coke Plant: Installation of a screening station to furnish all commercial sizes of domestic coke.

Sheet Mills: Installation of scrubber and drier equipment.

Tube Mills: Installation of threading machines to handle 6-in. to 16-in. pipe, and special equipment for the upsetting of drill pipe.

Seamless Tube Mills: Rearrangement of the warehouse and threading floor equipment.

General: Installation of six 2500-hp. B & W blast furnace gas-fired boilers with auxiliary equipment to enable this equipment to be operated with pulverized coal; an 18,000-kw. turbogenerator, and frequency changer together with necessary transmission lines.

Struthers Works

Installation of sand blast equipment in connection with this rigid conduit department.

Brier Hill Works

Installation of a new normalizing furnace for the sheet mills and the remodeling of two sheet mill furnaces.

Evanston Works

Installation of heat-treating furnaces operated by gas for well point department.

Indiana Harbor Works

Coke Plant: Installation of a complete creosote plant, a 5000-gal. acid washer, heat exchangers in the benzol plant, gas saving apparatus and a surplus coke gas line from the coke plant to the steel department.

Blooming Mills: Installation of slab shear with runout table and scales.

Blast Furnace Plant: A new skip pit elevator for No. 2 furnace. The installation of automatic bell operation and test rod apparatus and gas burners for the stoves on No. 2 furnace. The installation of automatic safety clamps for the No. 1 ore bridge.

Tube Mills: Complete installation of an acetylene gas generating plant. A new tester for large lapweld pipe, and an installation of automatic meters on testing apparatus.

General: A new bridge over the main line tracks of the New York Central, B. & O., and E. J. & E. railroads was complete, thus giving access to the plant without any grade crossing.

South Chicago Works

Installation of a modern coke plant consisting of 70 Koppers ovens. Gas cleaning apparatus for the blast furnace gas used for firing coke ovens.

New construction under way and scheduled for completion in 1929 is as follows:

Campbell Works

Complete electrification of one blooming mill, and the bar, billet and skelp mills.

The remodeling of blast furnaces.

Indiana Harbor Works

Installation of 10-in. and 14-in. and 18-in. merchant bar mills. Addition of three 150-ton open-hearth furnaces and two soaking pits. A complete sintering plant and a 250-ft. extension to the ore yard and dock.

Wheeling Steel Corporation

Important improvements and rearrangements, which Wheeling Steel Corportion, Wheeling, W. Va., has made at its several plants during 1928, are as follows:

Steubenville Works: A new continuous 60 in. wide strip mill is in course of construction, and is being prepared to be ready early in 1929. Rebuilding of the pipe mills for large size pipe was accomplished. A new park of cinder cars for blast furnaces was purchased.

Riverside Plant: The blast furnaces recently bought from the National Tube Co. were reconditioned, and delivery of hot metal from Riverside blast furnaces to Benwood plant was arranged.

Benwood Plant: Railroads, scales, and buildings for receiving of hot metal from Riverside Plant were built and installed. The pipe mills were rebuilt.

Beach Bottom Plant: The terne plate department was rebuilt.

Yorkville Plant: Four hand tinning machines were replaced by automatic machines and new improved cleaners were installed.

Portsmouth Plant: A new track-spike department was built, and new fence weaving machinery was installed.

John A. Roebling's Sons Co.

The John A. Roebling's Sons Co., at its Roebling, N. J., plant during the year 1928, completed a 320-ft. extension to wire mill No. 4 and equipped it for testing and reeling wire for the Hudson River bridge.

A 158 ft. x 420 ft. extension to wire mill No. 3 has been practically completed.

An 18-in. billet mill to roll 4-in. billets to 2-in. billets and a Morgan continuous rod mill to roll 2-in. billets to No. 5 and No. 7 rods is nearing completion.

A 15,000-kva. substation is under construction, of which 9000 kva. capacity will be put in operation early in 1929.

An 1800-ft. long, 300-ton capacity measuring equipment for measuring bridge ropes under tension has been completed.

Additional wire drawing and galvanizing machinery was installed.

At the Trenton plant, Trenton, N. J., a physical laboratory 40 ft. x 147 ft. x 50 ft. high, was completed together with the installation of a Riehle precision 2,000,000-lb. capacity wire rope testing machine.

The 1929 construction program has not as yet been determined.

Republic Iron & Steel Co.

The Republic Iron & Steel Co., Youngstown, reports the following improvements during 1928 and as under way or contemplated during 1929:

At the Brown-Bonnel works, Youngstown, Ohio, a spike department was installed in connection with the 7-in. continuous bar mill. Sizes from 2 in. x ¼ in. to 8 in. x ⅝ in. are made and the capacity of the new equipment is 700 tons a month.

No. 1 blast furnace at Haselton (Youngstown), was dismantled during the year.

No. 2 blast furnace at Thomas, Ala., was rebuilt and its capacity increased by 50 tons a day.

At the Warren, Ohio, works, to No. 2 hot strip mill there was added one 4-high finishing stand, 11 in. and 23 in. x 24 in. To No. 2 cold strip mill there was added three 4-high cold mill stands, 14 in. and 32 in. x 42 in., and to No. 1 cold mill, one 2-high cold mill stand 20 in. x 30 in., while there is now building one 2-high cold mill stand 20 in. x 42 in., also for the No. 1 cold mill.

Weirton Steel Co.

The Weirton Steel Co., Weirton, W. Va., has completed another open-hearth furnace, making a total of 12, having an annual productive capacity of 1,250,000 gross tons. The new unit, No. 12, was built for a capacity of 250-ton heats. An additional row of pit furnaces for heating ingots for the blooming mill also has been completed. Finishing and shipping facilities of the older strip mills have been enhanced by an addition of 180 ft. to the shipping building and the construction of a new building which permitted rearrangement of mills, and an enlargement of the department for finishing hot-rolled steel. A third billet heating furnace to serve the 16-in. hot strip mill is nearing completion.

For completion in 1929 there is under way a 240-ft. extension of the open-hearth stock house, with additional charging equipment to take care of the increased production of the open-hearth furnace plant. The company has contracted for an additional continuous pickler and a normalizing furnace for the 48-in. hot strip mill.

Jones & Laughlin Steel Corporation

The Jones & Laughlin Steel Corporation, Pittsburgh, started and completed in 1928 the construction of a second seamless pipe mill and an upsetting plant at its Aliquippa works. This mill produces the smaller sized tubular products and with the first unit, described in THE IRON AGE, Nov. 30, 1928, the corporation now is equipped to manufacture seamless pipe in sizes ranging from 2⅜ in. outside diameter to 13⅜ in. outside diameter.

There were built during the year eight additional soaking pits in the Aliquippa blooming mill department. At the South Side (Pittsburgh) plant equipment was installed for the manufacture of sheet piling of a patented and improved design.

Central Iron & Steel Co.

The Central Iron & Steel Co., Harrisburg, Pa., made the following improvements and additions to equipment for 1928:

Extension to universal mill shipping house.

Installation of a 150-hp. horizontal fire-tube waste heat boiler in the 126-in. mill.

An additional 54-in. Fuller-Lehigh coal pulverizing plant with all necessary auxiliary equipment was installed for furnishing pulverized coal to all the plate mill heating furnaces.

Equipment was installed for the manufacture of forging billets, including Gathmann molds equipped with hot tops.

A brass foundry has been added to the present cast iron foundry to manufacture brass castings for the company's use.

Improvements contemplated for 1929 are as follows:

Installation of eight 150-hp. horizontal fire-tube waste heat boilers on the heating furnaces in the plate mills and six 500-hp. boilers of the same type on six 90-ton open-hearth furnaces.

Installation of a new 6900-volt substation.

Timken Steel & Tube Co.

The Timken Steel & Tube Co., Canton, Ohio, carried out a large plant extension program during the year. New construction work already completed except where otherwise noted was as follows:

Melting Plant: An extension was built to the open-hearth stock house buildings; two 100-ton stationary open-hearth furnaces and one 20 x 29 ft. Heroult electric furnaces were installed. In addition a stripper building and a skull cracker building were erected.

Rolling Mill Department: A soaking pit building, a bloom storage building, a bar mill building, a 10 and 12 in. mill building, a shipping building and a roll shop were erected. New installation included a battery of three 2-hole soaking pits, two 40-ton continuous bloom heating furnaces, a combination 6-stand 28-in. and 22-in. bar mill, a hot saw, an extension to the bar mill hot bed, a 16-stand 10-in. and 12-in. merchant mill complete with a 240-ft. mechanical hot bed and a 30-ton continuous furnace for the 10-in. and 12-in. mill.

Tube Mill: A new tube mill building was erected and in this are being installed a complete 36-in. seamless tube mill with two 20-ton billet heating furnaces, a 36-in. piercer, 28-in. automatic mill and a 26-in. reeler. It is expected that the new tube mill equipment will be completed this month.

Heat-Treating Equipment: During the year there were built an 850-kw. electric pit type furnace, a 1000-kw. continuous electric normalizing furnace and two 120-kw. pit type electric annealing furnaces for coils. Another 850-kw. electric pit type furnace is under construction and will be completed in February.

Other construction work during the year included the erection of a steel mill office and laboratory and a 45,000-kw. main substation.

The company in October acquired by purchase the plant of the Weldless Steel Tube Co., Wooster, Ohio, which is a complete 14-in. seamless tube mill.

Ford Motor Co.

The Ford Motor Co., Detroit, last year started the construction of three 100-ton stationary type open-hearth furnaces and three 4-hole soaking pit furnaces, all of which will be completed early this year. This company last year completed a 10-in. merchant rod and hot strip mill with a capacity of 12,000 tons per month.

Otis Steel Co.

The Otis Steel Co., Cleveland, last year erected and placed in operation three 150-ton open-hearth furnaces with an annual capacity of 270,000 gross tons. Three 6 or 8-ingot soaking pits were erected to take care of the additional open-hearth capacity. This company during the year also erected one normalizing furnace in its sheet mill, one continuous heating furnace in its hot strip mill and one port heating furnace in its plate mill. The extensions were all at the company's Riverside plant.

Interstate Iron & Steel Co.

The Interstate Iron & Steel Co., Chicago, completed last year a 21-in. Morgan billet mill, driven by a 6000-hp. motor furnished by the Allis-Chalmers Co., Milwaukee.

It also completed the construction of a new 100-ton basic open-hearth furnace. Plans are under way to provide another open-hearth furnace during 1929.

Donner Steel Co.

The Donner Steel Co., Inc., Buffalo, N. Y., last year added to its equipment one 15-ton Heroult electric melting furnace, also a cold drawing department with a capacity of 1000 tons a month.

During 1929 the company has under construction an addition to its cold drawing department, which will increase the capacity to 2000 tons a month.

Atlantic Steel Co.

The Atlantic Steel Co., Atlanta, Ga., completed the installation in December of a MacKintosh-Hemphill 12-in. rolling mill. It consists of three 3-high stands and one 2-high stand, driven by an 800-hp. variable speed motor. It is an auxiliary of the company's present mills and is estimated to increase the capacity about 5000 tons per year.

Wisconsin Steel Co.

The Wisconsin Steel Co., Chicago, completed and put in operation during April and May, last year, at its South Chicago plant two 100-ton open-hearth furnaces.

Laclede Steel Co.

The Laclede Steel Co., St. Louis, has completed plans for construction during 1929 of a 100-ton open-hearth furnace, which will make the fourth one operated by the company.

Acme Steel Co.

The Acme Steel Co., Chicago, during 1928 has improved its new strip steel mill for rolling up to 20-in. widths. The cold rolled mill building has been enlarged by a structure 100 x 500 ft. and contracts have been awarded for a 4-high line of four mills, rolling up to 20 in. wide. Contracts have also been awarded for an additional hot strip mill to roll from 6 in. wide and narrower. This unit will consist of 14 stands tandem to be housed in two structures 80 x 700 ft. and 100 x 400 ft. These buildings and machinery are now in the course of construction.

Scullin Steel Co.

The Scullin Steel Co., St. Louis, during 1928, erected an addition to its rolling mill. This is a structure 75 x 210 ft. and houses a 16-in. mill with two roughing stands, a 14-in. mill with two roughing and one finishing stand, a 12-in. mill with three roughing and two finishing stands and an 8-in. mill with four roughing and one finishing stand. This company has also built a structural storage building, 120 x 200 ft. and a railroad spike shop for the manufacture of standard railroad spikes.

Steel & Tubes, Inc.

Steel & Tubes, Inc., Cleveland, in December completed the erection of a new tube mill at Ferndale, Mich. This will be ready for operation early this year and will have a capacity of approximately 3,000,000 ft. per month of light gage electric welded steel tubing. The new plant, built on a 20-acre site, occupies a building, 210 x 535 ft. with boiler house and electric substation.

Sharon Steel Hoop Co.

The Sharon Steel Hoop Co. has completed and placed in operation at its Sharon, Pa., works, a thoroughly modern cold-rolled strip plant, comprising 18 stands, all roller bearing, electrically controlled. There are four large cluster mills tandem, four medium size cluster mills tandem, 4-stand 2-high small mills tandem with two edging mills in the line, the balance being single 2-high mills. There is also a complete installation of auxiliary equipment such as shearers, slitters, polishers, etc. There was also erected during the past year a large modern pickling department at the Sharon plant to serve both the general trade and the new cold-rolled department. Rated capacity of the cold-rolled plant is 4000 tons per month.

There is under construction at the Sharon plant, which will be put in operation probably in March, 1929, a new continuous hot-rolled strip mill rolling hot strips in full length coils up to 12 in. wide, electrically driven throughout. The mill is being built by the Morgan Construction Co., Worcester, Mass., and the electrical equipment by the General Electric Co., Schenectady, N. Y. Rated capacity of this mill will be 12,000 tons per month.

Pittsburgh Steel Co.

The Pittsburgh Steel Co. has under construction at Monessen, Pa., a boiler plant consisting of four 1400-hp. boilers to be operated at 400-lb. steam pressure and 200-deg. superheat. Some of the mill drives have been motorized, the first step in the general electrification of the mills to be completed in the next three years.

A. M. Byers Co.

Capacity of the Warren, Ohio, plant A. M. Byers Co. for the production of Aston metal was brought up to 200 tons daily in 1928. At its Pittsburgh works the company began and now has in progress the installation of a new lapweld mill to produce pipe from ¼ in. to 4 in. in diameter. Additions to the pipe threading equipment and an extension of the galvanizing department also are in progress. The construction work has been started on a new plant at Ambridge, Pa. It will have an annual capacity of from 300,000 to 350,000 tons of skelp, plates and billets.

Allegheny Steel Co.

Allegheny Steel Co., Brackenridge, Pa., spent approximately $750,000 in 1928 in plant improvements and extensions. Rolling mill equipment and electric furnaces for melting and heating were added in connection with the development of "Ascaloy," "Allegheny Metal" and other alloy products. Appropriations for 1929 total approximately $700,000 for plant extensions for the manufacture of the company's specialties.

Firth-Sterling Steel Co.

The Firth-Sterling Steel Co., McKeesport, Pa., during the past year, added three new Swindell electric annealing furnaces in the tool steel department, a modern 10-in. mill replaced one of same size, and an Ajax-Northrup high frequency electric melting furnace (the first ordered for the manufacture of tool, die, alloy and stainless steels in this country) will be in operation by April, 1929.

An addition to the research laboratory was built for the development of dimondite, a tungsten carbide material for cutting tools. Plans for 1929 include the erection of a complete separate plant for the manufacture of this new composition.

Heppenstall Forge & Knife Co.

Heppenstall Forge & Knife Co., Pittsburgh, installed last year two 600-lb. Ajax-Northrup high-frequency electric induction furnaces, which are to be used entirely for the production of high-grade shear knife and die steels. In addition they built a new hardening department for hardening shear knives and they also added four car-type heat-treating furnaces to the heat-treating department.

Continental Steel Corporation

The Continental Steel Corporation, Kokomo, Ind., which was formed early in 1927 through a consolidation of the Superior Sheet Steel Co., Canton, Ohio; the Kokomo Steel & Wire Co., Kokomo, Ind.; and the Chapman-Price Steel Co., Indianapolis, Ind., last year completed the construction of one 100-ton basic open-hearth furnace at its Kokomo, Ind., plant. There was also finished in April, 1928, a 19-in. continuous sheet bar and billet mill, electrically driven.

For 1929 the company plans the construction of a 100-ton basic open-hearth furnace which should be completed some time during the spring. Its completion will bring the total capacity of the Kokomo plant to five 100-ton open-hearth furnaces.

Other Steel Works Additions

The Pacific Coast Steel Co., San Francisco, is commencing the erection of a bolt and nut plant at its works at South San Francisco, which is expected to be in operation during the first half of this year.

Henry Disston & Sons, Inc., Tacony, Pa., added last year to its rolling mill capacity a 6-ton cogging hammer, but has no plans for new construction this year.

The Wickwire Spencer Steel Co., at its plant at Buffalo, N. Y., added new equipment last year in the form of soaking pits, ingot buggies and a stripping crane.

The Marion Steam Shovel Co., Marion, Ohio, last year improved its open-hearth furnace by insulating the checker chambers and slag pockets covering them with steel jackets.

The Gulf States Steel Co., Birmingham, Ala., last year motorized its rod mill and completed the building of a new power plant at the blast furnace, as well as the rebuilding of the blast furnace itself.

The Follansbee Brothers Co., Pittsburgh, added three normalizing furnaces in the past year at its Toronto, Ohio, works and is now installing a sheet mill capable of rolling automobile body sheets up to 66 in. wide. The new mill is expected to go into operation in March.

The Latrobe Electric Steel Co., Latrobe, Pa., soon will begin the erection of a 100-ft. extension to its main building and will install an 8-ton steam hammer, additional boiler capacity and possibly a 5-ton crane.

Spang, Chalfant & Co., Inc., Pittsburgh, has under construction a building at its Ambridge, Pa., works which will house no additional productive capacity but will enable the company to operate more economically and efficiently than has been possible heretofore.

Apollo Steel Co., Apollo, Pa., made improvements in its finishing departments costing $150,000, which raised the efficiency of the plant but did not increase the rated productive capacity.

Blast Furnace Construction

SOME of the improvements to blast furnace construction, not included in the introductory paragraphs of this analysis, are presented as follows:

Federal Furnace Co.

The Federal Furnace Co., South Chicago, Ill., is having plans prepared for a new 1000-ton blast furnace with neces-

sary auxiliary equipment. A new ore dock will be constructed to meet the demands of this furnace. No definite date is set for its completion. The company plans to rebuild one of its furnaces to a larger capacity.

Zenith Furnace Co.

Zenith Furnace Company, Duluth, Minn., has about brought to completion a large reconstruction program which provides a new 41-oven battery of the latest type of Becker oven constructed by the Koppers Construction Co. of Pittsburgh, including the by-product buildings incident thereto.

The program also includes a new coal dock to replace the present old structure which has been in operation for 23 years. The new dock is equipped with two industrial Brown-Hoist 10-ton unloading bridges and a Link-Belt tipple screening plant of a rather unique design and one which never before has been used on coal docks on the Great Lakes.

Hanna Furnace Co.

The Hanna Furnace Co., Cleveland, during the year tore down to the foundations one of its Buffalo furnaces, formerly the No. 4 Rogers, Brown & Co. stack, and rebuilt it, enlarging the furnace to a daily capacity of 800 tons. The dimensions of the new stack are hearth diameter 20 ft., bosh diameter 24 ft. 3 in., diameter at stock line 17 ft., height 85 ft. 4½ in. A new gas washer and new gas cleaner were installed and new slag pits were built. Steinbart burners were placed on the stoves and boilers. A new gas washer was installed at the No. 3 furnace, new Steinbart burners were placed on the stoves and new slag pits were erected. The company is now installing a new pig casting machine at these Buffalo furnaces that duplicates the old unit.

The Toledo Furnace Co., Toledo, Ohio, during the year relined its A furnace and increased the hearth diameter from 18 ft. to 19 ft. 6 in. It also erected an electric hoist, which replaced a steam driven skip hoist.

Davison Coke & Iron Co.

Davison Coke & Iron Co., Pittsburgh, which last September acquired the Neville furnace of the American Steel & Wire Co., Neville Island, Pittsburgh, is replacing three steam blowing engines with two turboblowers. A new boiler plant, a cement works and a by-product coke plant, the first unit of which will be 35 Koppers-Becker ovens with coke and coal handling equipment, by-product, benzol and gas purification units, are in course of construction.

The Shenango Furnace Co., Pittsburgh, has been adding to the equipment in its ingot mold foundry. These additions have permitted increased production and the company is figuring on increased tonnages for 1929.

The Woodward Iron Co., Woodward, Ala., did not add any new producing capacity last year, but completed a new coke loading wharf, designed to handle 2500 tons of coke per day, with suitable screens for preparation of the various market sizes.

The Jackson Iron & Steel Co., Jackson, Ohio, in 1928 enlarged its blast furnace stack 20 per cent with Dovel metal top and a McKee revolving top. There was also installed a Pittsburgh coal washer and a pig casting machine.

Witherbee, Sherman & Co., Port Henry, New York, added two Greenawalt sintering pans with auxiliary equipment to its sintering plant last year; this work was under way during 1927. For 1929 no new capacity is being planned.

Additions to Rolling Mills

MANY of the large steel companies made substantial additions to their rolling mills last year or have them under way for this year. Details are included under each company's report on other pages. Information concerning other companies is as follows:

The Highland Iron & Steel Co., Terre Haute, Ind., completed late last year an 8-in. guide mill which has 10-in. Belgian roughing rolls, one stand, three-high and five stands of 8-in. finishing rolls. It is driven by an Allis-Chalmers Corliss engine with rope drive.

The Kilby Car & Foundry Co., Anniston, Ala., last year installed a new bolt plant with a capacity of 300 to 400 tons of bolts per month.

The Washburn Wire Co., Phillipsdale, R. I., last year completed and put in operation a 10-in. mill, and placed in service a new billet yard with an overhead traveling crane.

The Sheffield Steel Corporation, Kansas City, Mo., added one 2500-hp., 18-in. continuous mill, electrically driven.

The West Virginia Rail Co., Huntington, W. Va., last year added one 600-hp., one 500-hp. and one 1000-hp. mills, all electrically driven.

The Globe Steel Tube Co., Milwaukee, added last year four 350-hp. and one 1200-hp. tube mills, all electrically driven.

The Joslyn Mfg. & Supply Co., Fort Wayne, Ind., will build during 1929 a train of 16-in. rolls and will install gas producers. It will also further electrify its mill.

The Barton Spiderweb System, Inc., Chicago, fabricator of steel reinforcing bars, has erected a mill building 100 x 604 ft. where it has installed a 10-in. mill consisting of six 3-high stands. This mill will be used for rolling bars and light structural shapes from old rails and billets.

Extensions to Foundries

ADDITIONS and improvements to foundries were meager last year from the few reports received. A summary of these follows:

Changes in the plant of the Vulcan Mold & Iron Co., Latrobe, Pa., have been made with an eye to handling economies rather than to increasing productive capacity. This company has developed a new metal for ingot molds, called "Vulc-Iron," which, it is claimed, has about double the tensile strength of ordinary cast iron and gives longer life to ingot molds, as the greater strength retards fire cracking by which molds normally fail. Experimental work on this metal was started early in 1928 and molds made from it now are being marketed regularly.

The Deemer Steel Casting Co., New Castle, Del., is planning during the early part of this year to start the manufacture of manganese steel castings which will be an added product to the carbon and various alloy steel castings which the company already produces.

The Union Steel Casting Co., Pittsburgh, is installing a 1 to 1½-ton Heroult electric furnace in its No. 1 foundry for making alloy and carbon steels. This furnace replaces a 20-ton open-hearth furnace and will mean no increase in the company's capacity.

The National Foundry Co., Erie, Pa., last year doubled its machine shop capacity devoted exclusively to machining its own steel castings and manufacturing cut gears and pinions. The company expects to increase the range of production by a grinder addition to the gear cutting department.

The Kinney Iron Works, Los Angeles, Cal., one of the largest foundries in the southern part of the State, has just completed a program of expansion which is expected to double the size of the existing plant.

The Hyde Park Foundry & Machine Co., Hyde Park, Pa., in 1928 occupied its new plant, built on the site of the old Hyde Park works of the American Sheet & Tin Plate Co., providing more than double the floor space of the old plant. A modern plant building and new equipment have added materially to productive capacity and efficiency.

New Canadian Capacity

A FEW of the steel companies in Canada have made, or have under way, additions to capacity or equipment. A summary of the reports received follows:

The Manitoba Rolling Mill Co., Ltd., Winnipeg, Man., erected at its plant at Selkirk in Manitoba last year a second open-hearth furnace with capacity of 80 tons per 24 hr. This increases the company's capacity to 160 tons per day of 24 hr. The company plans to construct this year a 20-ton open-hearth furnace and a rolling mill with a capacity of 30,000 tons per year at Calgary in the Province of Alberta for the production of new rolling mill accessories. Natural gas will be used as fuel and electric power for driving the rolling mill. It is hoped to have this plant in operation by Sept. 1, 1929.

The Dominion Iron & Steel Co., Ltd., Sydney, Nova Scotia, installed in 1928 two complete units for punching, cambering and shearing hot-worked, or high-carbon, tie plate. Each machine is equipped with a coke oven gas-fired furnace and the capacity of each unit is 90 tons per double shift. The only construction now in hand, or contemplated for 1929, is the rebuilding of the sulphuric acid plant for making acid used in the manufacture of sulphate of ammonia. This plant will probably be completed in March.

The Steel Co. of Canada, Ltd., Hamilton, Ont., Canada, has under construction a 16-in.—12-in.—10-in. semi-continuous bar mill.

This Issue in Brief

Steel output breaks yearly record. Ingot production was close to 50½ million tons, a gain of 3½ million tons over 1926, the previous record year.—Page 1.

* * *

Outlook less favorable than one year ago, says Dr. Haney. Business is now at a peak. Most indications suggest a decline during part of 1929. Urges caution in planning business expansion beyond early spring months.—Page 10.

* * *

Lower cost pig iron may result from blast furnace improvements, says authority. New and improved plants should be able to market iron at prices holding no profit for conventional plants.—Page 34.

* * *

Fewer and larger foundries, says Dr. Moldenke. Demand for quality will become more imperative. "High-test" cast iron will help reclaim lost markets. Cost reductions incident to quantity production will give castings buyers increasing value for their money.—Page 45.

* * *

Labor attracted to plants with modern equipment, calling for less manual effort and offering prospects for increased earnings. Adoption of bonus systems is stimulated by installation of high-production machine tools.—Page 48.

* * *

Mergers reduce number of available customers, thus concentrating buying power, and promoting instability between customer and vendor, says drop forging manufacturer. Drop-forging industry is active now, but fear is felt that manufacturing capacity added in 1928 will prove a handicap in lean years.—Page 51.

Trade practice conferences hurt rather than helped by Federal Trade Commission's interpretation of agreements as legally binding, says attorney. Many manufacturers are being counselled not to participate in conferences.—Page 59.

* * *

Secrecy handicaps die-casting industry. Information is not exchanged. Methods of manufacture and compositions of alloys are jealously guarded, leading to enormous wastes. All would gain by cooperative effort, die-casting engineer believes. Without cooperation, England may surpass us in die-casting technical knowledge.—Page 53.

* * *

Hammering prices below profit point eliminates weaker vendors, says sales director. This encourages consolidations among stronger vendors, who then are able to dictate prices and policies. Thus, close buying policy proves a boomerang.—Page 63.

* * *

Labor turnover cut by better industrial management. Employment trend is upward despite increase in labor-saving equipment. Skilled workers are in general demand. Personnel authority favors pension plan.—Page 69.

* * *

Small manufacturer can compete successfully with big companies. Usually his overhead is relatively lower; he is closer to his customers; he can "turn around" faster. Large corporations are most successful in production of staple mass goods.—Pages 63 and 76.

* * *

Mergers encouraged by desire for protection against demoralized prices. Large number of consolidations in 1928 recalls the '80's and '90's. Present danger is that mergers will be overdone.—Page 76.

Foreman-training pays dividends. Some foremen are merely expert workmen. Leadership can be developed by foremen's meetings outside of working hours. Foremen can work intelligently only if given *all* the facts of the business and the management's policies.—Page 71.

* * *

Forecasts for metal-consuming industries. Record of 4,640,000 automobiles and trucks made in 1928 may be topped in 1929.—Page 19. Aircraft industry made 4000 planes in 1928; may triple output in 1929.—Page 20. Building volume for 1929 will be about the average of past four years.—Page 16. Power farm equipment industry, already operating at capacity, looks for even larger 1929 business.—Page 33.

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Sales to Latin-American countries should increase rapidly, Government official believes. Remarkable development in countries south of United States offers a great export market for American goods.—Page 26.

* * *

Should the order be placed with warehouse or mill? Jobbers say buyers can save money by placing with the warehouses many of the small orders now going to the mills. Warehouse business improved in 1928.—Page 34.

* * *

Avoid "emergency buying" of machine tools, says machine tool builder. When buyer is not driven by necessity, he is more likely to get the best machine for his purposes.—Page 49.

* * *

Automotive industry is leading steel consumers for first time in history. It took 18 per cent of 1928 steel output, building construction was second, and railroads fell to third place. Analysis of shipments by States reveals that Pennsylvania, Ohio and Illinois are largest consumers of steel-mill shipments.—Page 7.

High Lights of 1928

January

WORLD iron and steel outputs in 1927, amounting to 84 and 98 millions of tons respectively, exceed pre-war level for first time. . . . New cast iron pipe unit of McWane Cast Iron Pipe Co. at Birmingham, employing substitution of mechanical equipment for hand labor, goes into production. . . . Empire Steel Corporation is formed by consolidation of six northern Ohio sheet mills with capacity for 400,000 tons of finished products annually. . . . B. F. Jones, Jr., chairman Jones & Laughlin Steel Corporation, dies in Pittsburgh. . . . Weirton Steel Co. takes out license from American Rolling Mill Co. to use patents for continuous rolling of sheets and strips. . . . Spang, Chalfant & Co., Inc., and Standard Seamless Tube Co., large makers of welded and seamless pipe, are merged. . . Dunbar furnaces at Dunbar, Pa., on site where pig iron had been made for 138 years, are dismantled. . . . Airplane used for transportation of steel, carrying rivets from Chicago to Iowa City, Iowa, a distance of 236 miles, in one hour and 50 min. . . . Average annual production of pig iron per furnace in blast in the United States has increased from 29,570 tons in 1891 to 176,700 tons in 1927, survey shows.

February

NATIONAL Association of Flat Rolled Steel Manufacturers is formed by combining Hot-Rolled Strip Steel Institute, Cold-Rolled Strip Steel Institute and National Association of Sheet and Tin Plate Manufacturers. . . . Saunders Medal for achievement in mining engineering is awarded to Herbert Hoover by American Institute of Mining and Metallurgical Engineers. . . . Iron, Steel and Allied Industries of California plan Western States Iron and Steel Institute to include 11 Pacific Coast and Rocky Mountains States. . . . Pittsburgh, Lisbon & Western Railroad files application to construct rail links which would provide direct rail connection between Youngstown district and Ohio River. . . . Stampings manufacturers organize Pressed Metal Institute.

March

LEADING makers announce new schedule of alloy steel bar prices based upon producing costs and with common base price. . . . Plans are dropped for merger of Youngstown Sheet & Tube Co. and Inland Steel Co., which would have brought together ingot capacities of 5,000,000 tons, and Youngstown company announces further expansion of Chicago district properties. . . . Steel furniture orders in February, totaling $3,295,861, establish new record. . . . Producers of gray iron castings organize American Gray Iron Institute to study and correct evils in their industry. . . . Metallic arc welding is employed in erection of manufacturing building in Philadelphia requiring 1000 tons of structural steel. . . . Twenty leading steel companies earned only 5.1 per cent on total stockholders' value in 1927, analysis shows, as compared with 7.3 per cent in 1926. . . . No. 5 Aliquippa furnace of Jones & Laughlin Steel Corporation produces 30,287 tons of pig iron during month, a daily average of 977 tons, and probably record for furnace running on ore and its own scrap.

April

FIRST all-welded steel bridge for rail traffic completed at Turtle Creek, Pa. . . . Wrought Iron Research Association is formed by leading manufacturers of wrought iron to disseminate information about product. . . . Gear manufacturers adopt standard nomenclature for bevel gears covering 89 items. . . . Pig iron constituted less than 45 per cent of open-hearth charge during first quarter of year, calculations show, the remaining 55 per cent having been scrap. . . . Elmer T. McCleary succeeds Thomas J. Bray as president of Republic Iron & Steel Co. . . . National Metal Trades Association goes on record against anti-injunction legislation to curb powers of Federal Courts in labor disputes.

May

CHARLES M. SCHWAB, chairman Bethlehem Steel Corporation, receives Bessemer Gold Medal from British Iron and Steel Institute for distinguished merit in promoting metallurgy of iron and steel. . . . Chamber of Commerce of the United States adopts resolutions calling for dissemination of more information on true costs of production and distribution and for system of firm prices and bids. . . . American Foundrymen's Association holds dinner for organizers at thirty-third annual convention in Philadelphia, the scene of its founding. . . . National Supply and Machinery Distributers' Association, Southern Supply and Machinery Dealers' Association and American Supply and Machinery Manufacturers' Association inaugurate consolidation plans. . . . Chicago district steel makers granted lower freight rates on shipments to Pacific Coast by way of New Orleans.

June

FLAT rolled steel manufacturers unite to promote program of trade extension and market research activities. . . . Building construction during May, amounting to $668,097,000 in 37 States east of Rocky Mountains, was 4 per cent higher than in any previous month. . . . Pittsburgh & West Virginia Railroad is authorized to build additional rail link between Connellsville coke region and Pittsburgh district. . . . Steel Export Association of America is organized by leading steel producers to act as single corporate entity in cultivating foreign trade more effectively. . . . Representatives of 17 manufacturing industries meet with jobbers in New York under auspices of Bolt, Nut and Rivet Manufacturers Association to develop plan for cutting distribution costs.

Metal Trades in Review

July

NATIONAL Industrial Conference Board head calls better planning of production the best solution to distribution problems. . . . THE IRON AGE composite pig iron price declines to $17.09 a ton, the lowest figure in more than 12 years. . . . South African Iron & Steel Industrial Corporation, Ltd., created by South African Parliament to manufacture iron and steel in that country. . . . Department of Commerce inaugurates survey to determine amount of obsolete industrial equipment and its effect on competition. . . . Country's total theoretical rolled steel capacity is estimated at 52,196,000 tons, according to survey by THE IRON AGE, a gain of 21 per cent in last five years. . . . Institute of Scrap Iron and Steel is formed to eliminate unfair and unprofitable business practices in that business. . . . Leading sheet makers announce reduction of cash discount on sheets from 2 per cent in 10 days to ½ per cent.

August

COUNTRY'S total theoretical blast furnace capacity, as of Aug. 1, fixed at 50,194,620 gross tons, indicating average daily capacity per furnace of 453 tons. . . . Recommendation by Interstate Commerce Commission of a mileage scale for freight rates on iron and steel products in Official Classification territory may force industry to adjust itself to new competitive conditions. . . . Machinery exports during July amounted to $47,814,163, the highest total since January, 1921. . . . New extras for special analysis steels add $1 to $5 to old prices. . . . Survey shows that New England manufacturers are successfully using research methods to develop new products and new uses for old ones. . . . Republic Iron & Steel Co. takes over Steel & Tubes, Inc., manufacturer of electrically welded steel tubing. . . . Bausch & Lomb Optical Co., Rochester, N. Y., maker of optical and precision instruments, observes seventy-fifth anniversary of founding. . . . James Bowron, chairman Gulf States Steel Co. and one of pioneer steel masters of the South, dies at age of 84 years.

September

STEEL fabricator cites code of standard practice to obtain proper relationships among competitors and between mills and buyers as greatest need for structural steel industry. . . . Exports of iron and steel products in August, amounting to 287,297 tons, are largest since February, 1921. . . . Sheet steel jobbers protest action of mills in reducing cash discount on sheets. . . . Department of Commerce opens Pittsburgh office to aid manufacturers in obtaining information on export markets and operate as clearing house for information on domestic marketing. . . . Welsh and American tin plate mills come to agreement to limit competition in Canada, South America and Italy. . . . Dr. E. G. Acheson creates trust fund as basis for awards of gold medal and prize every two years to person who has made distinguished contribution to any branch of American Electrochemical Society.

October

FLAT rolled steel association president urges purchasing agents to oppose "ruthless buying" practices. . . . Award of John Fritz Medal to Herbert Hoover for achievement in engineering is announced by Engineering Foundation. . . . Fluorspar duty is increased 50 per cent, or from $5.60 to $8.40 per gross ton, upon recommendation of Tariff Commission. . . . A. M. Byers Co. announces $10,000,000 expansion program to develop facilities for utilizing Aston process in making wrought iron. . . . George M. Verity, president American Rolling Mill Co., at Iron and Steel Institute meeting, urges steel producers to make more intensive study of customers' business in order to extend market for their products. . . . Toledo furnace of Pickands, Mather & Co. ends run of nearly nine years on one lining, having made 1,823,251 tons of merchant pig iron, an average of 564 tons daily.

November

THREE American companies unite to secure right to manufacture chrome nickel alloy in this country under Krupp patents. . . . Lockout in German steel mills involves more than 200,000 men. . . . Charles H. MacDonald, market research manager of Colorado Fuel & Iron Co., urges cooperative research and greater publicity to open up new market for steel, in talk before American Institute of Steel Construction. . . . October production of steel ingots, amounting to 172,144 tons daily, sets new record for all time. . . . William H. Barr retires as president of National Founders Association after 15 years in office and is succeeded by Col. Thomas S. Hammond, president Whiting Corporation, Harvey, Ill.

December

PIG iron output of 110,084 tons daily sets record for year and is best November since 1918. . . . Program is announced for first Western Metal Congress and Western States Metal and Steel Exposition to be held in Los Angeles under auspices of American Society for Steel Treating. . . . Taylor Society speaker calls research first need in marketing, stating that sales activity on this basis may be controlled as accurately as production. . . . Standard steel building manufacturers organize institute for cooperative marketing. . . . Six large brass manufacturing companies are consolidated to form Republic Brass Corporation, with assets of $39,000,000. . . . Constant gain in Ohio River shipments of steel products is emphasized by movement of 137,000 tons in November, bettering previous record by 7000 tons.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

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Economics of 1928

ECONOMICALLY the year that has just closed was good for the people of the United States. The production of commodities increased. Crops were good, the employment of workers was at or near the normal maximum percentage, and the manufacture and consumption of goods were both at a high rate. There was no accumulation of unsold stocks of goods and consequently no strain on credit on that account. In so far 1928 was a year of normally good times. It was not a year of such extraordinary advance as has become a matter of popular belief. That idea appears to be based on comparison with 1927, wherein there was a considerable slackening. A comparison of 1928 with 1926 is more rational, and such a comparison does not reveal any phenomenal gain.

Without any doubt there developed during 1928 an illusion out of the unprecedented behavior of the stock market, which, continuing an advance that began in 1927, recorded an appreciation in quotations aggregating many billions of dollars. The advance was halted early in December for the simple reason that the time had come when there were more sellers than buyers. Previous to that time the market had risen by the push of widespread buying, evincing an extraordinary appetite for corporate stocks. This is merely a recording of facts, without offering any explanation. Probably no one is yet able to give a full explanation. It has been suggested, however, that some change in our domestic economy has caused people to be satisfied with a return of 5 per cent who formerly required 6 per cent. This dismisses consideration of speculative by-plays that naturally would accompany such a change.

Anyhow, it is certain that such a writing up of value, although it may be reasonable, does not reflect a corresponding increase in national wealth. We have the same lands, buildings, railroads, etc., that we had a year ago, plus some new construction and less some loss by accident, deterioration, obsolescence, etc. Consequently the writing up of value became a species of inflation. This development is rather mysterious and no one sees very clearly what its outcome may be.

In general there was in 1928 an improvement in commodity prices, and to a large extent this was ascribable to rationalization in our industries. In almost every industry there is an excess of producing capacity and if its owners insist upon employing it to the maximum they are bound to produce what has been described as a profitless prosperity, even when there is a powerful demand. During 1928 there was an increasing appreciation of this and a growth of cooperation that developed an improved situation in many important industries. Gasoline, copper and zinc afforded good examples of this.

Probably the greatest economic development of recent times, especially in America, has been the increasing appreciation of the value of industrial statistics, which is to say knowledge, and with such a possession the awakening of intelligence in action. There is, however, certainly no magic in this, and probably only a limited prophetic power. If the statistics indicate that we are doing things that are economically bad we may reasonably forecast that we shall have to suffer the consequences; but the real usefulness of statistical knowledge, it seems to us, is to become able to avoid doing things that are bad and thus to avoid disagreeable consequences.

Nevertheless, the economic future must in the main continue to be a mystery. We are as yet unable to understand except vaguely what produces either spurts or recessions in our economy. In the past we have had periods of overbuilding, overmanufacturing and wasteful misadventure that we could understand, but since 1920 there has been nothing of that sort; yet we have had ripples if not waves in our affairs, which we are not able to explain; and when we can not explain we are hardly justified in trying to forecast. However, it is rational to assume that the increase in economic knowledge is reducing miscalculation and consequently is tempering our ups and downs.

We shall, therefore, view with benevolence the symposia of prophecies that are customarily presented by the press at the turn of the year, and may even find some diversion in the forecasts of professionals who go into details and sequences, without docketing them for derisive comment if in the course of time they prove wrong. We shall not venture to predict that 1929 will be better or worse than 1928. But either way we do not expect that the change, if any, will be very strong, for the simple reason that we have become less subject to miscalculation and better than ever do we know what we are doing, even if our knowledge be still imperfect.

WORLD iron and steel production figures, compiled elsewhere in this issue, show a number of interesting facts. The output of steel ingots and castings was 107,490,000 tons, a new record. Of this, the share of the United States was 48 per cent. The expansion over 1927 is 7,310,000 tons, or 7.3 per cent, and the United States contributed nine-tenths of the increase. Just as is true in this country, there is a widening spread between pig iron and steel produc-

tion. The world output of pig iron exceeded that of 1927 by only 1 per cent. Expressing it otherwise, steel tonnage last year was 43 per cent greater than in 1913, whereas that of pig iron gained 11 per cent, or one-fourth as much. No new records were made in the combined exports in iron and steel of the six leading exporting nations, but an increase in the excess of exports over imports of these six nations brought the total close to 14,000,000 tons, or 11 per cent larger than the excess in 1927 and 12 per cent larger than the difference in 1913.

Steel and the Business Revolution

THAT business has been revolutionized in the years since the Armistice has been affirmed and dwelt upon so often in speech and in print, especially in the past year, as to be now a commonplace. But even so, it has been the burden of numerous reviews of 1928 in trade and industry that have appeared in the past week. And no doubt the changes will be rung in many an address and many an article in 1929 on the thought that no executive has a chance to succeed who has not caught the significance of the new conditions and adjusted his business accordingly.

Whereas for several years after the severe setback of 1921 stress was put on the marvelous advance in mass production methods—in some quarters to the point of charging it with widespread unemployment—the past year has seen a great outpouring of literature on the revolution now under way in distribution.

On the one hand, in emphasizing selling economies, the rapid engrossment of retail trade by the chain stores has been exploited by hundreds of writers and their mass buying and mass selling have been pictured as the final phase of the revolution in merchandising. On the other hand, instalment buying has been touted, not as contributing to more economical distribution, for it is admittedly wasteful buying, but as a device by which the benefits of mass production can be reaped without piling up surplus output and creating unemployment.

These popular discussions of the post-war business revolution have said little of its manifestations in the steel industry. Being basic the steel industry is perhaps thought of as not much subject to the changes that have come over the secondary manufacturing lines that buy from it. Further, the great field of merchandising in which the innovations have taken such a heavy toll is considered quite another world from that of the steel maker.

Yet it is by no happy chance that steel works practice and equipment in 80 per cent of the country's plant are well standardized on a high level of efficiency. Marked handling and fuel economies have been worked out in the post-war years; cost has been reduced by more regular operation (especially in 1928), cutting down the peaks and lifting the valleys; blast furnace and open-hearth furnace outputs have been much increased, so that heavy outlays for new plant are not necessary.

All this work has gone on so steadily and quietly and with such good effect that the public little appreciates that the steel industry in recent years has gone through two changes that were quite as much revolutions as any of those the magazines have made spectacular. We refer to the substitution of the 8-hour day for the 12-hour day which had existed in American steel works from the beginning and to the abolition of Pittsburgh basing for steel prices, a practice ingrained in the trade for more than a generation.

While for half a decade the 8-hour day in steel production has been a solved problem, as much cannot be said for the issues involved in Pittsburgh Plus. Cross hauling, water shipments to non-tributary markets, and the disruption of intricate and long-standing freight rates in the contest for a new alinement of business have been no help to the effort for market stability.

Some steel market developments of 1928, while not revolutionary, suggest that the industry is far from static. The large amount of electrically welded pipe placed last year (three orders being for more than 100,000 tons each) indicates that it has taken a permanent place in the pipe field. The much larger outputs possible by this process than those of furnace lap-welding point to a considerable surplus of plant of the latter description in the near future.

For a number of years also the country's excess capacity for wire and wire nail production has been a steel trade problem, what with the great displacement of wood in house building, the lessened demand for wire fencing in the West and the large use of cartons instead of wooden boxing, not to mention the loss of export markets to the cheaper German product. Thus about half the country's wire plant suffices for present-day needs. There is also the overturning in the sheet industry due to the continuous mill and the coming on of strip mill competition.

First and last, therefore, steel manufacturers have had their own share of readjustment to new conditions. And now they are facing a period which demands not simply that they find ways and means of meeting situations that have been thrust upon them. Their industry must now take a place of leadership, not only as a stabilizer of markets but as an explorer of new fields for their product and a cooperator in developing and promoting secondary products into which steel largely enters.

Forecasting Growth

SO much was said just after the war about the country's excess industrial capacity that one would have expected a prolonged halt in the creation of facilities. That has not occurred. Year by year in the ten years now elapsed there has been more or less increase in manufacturing capacity. If there was a large excess that excess has been only gradually reduced.

It has been a matter of individual initiative, rather than a prospect of shortage, that has caused growth, a plain matter of competition. The company that expanded simply felt that it could hold its own against a large part of its competition. It was not counting upon scarcity to make the larger market for its product.

No doubt in many industries capacity has increased more than that in steel. Too much is usually made of the gap between the steel industry's production and its capacity. In making up a statement of post-war growth allowance should be made for com-

pletion of construction begun during the war; hence a comparison between capacity at the end of 1919 and that at the present time is fair. In steel ingots that is only about 20 per cent. From the end of 1913, or in 15 years, the increase is about 70 per cent. It requires very close figuring to show that there has been any smaller percentage engagement of capacity in the past year than there was in 1913, yet that year was quite an active one except in its last two months.

After ten years of almost continuous activity and of great advancement in methods there is wide latitude in judgment of what is to be expected in years to come. It is a question whether the progress means still greater quantitative growth or rather the attainment of a sort of maturity, so that in industry as a whole there will be more development by way of refinements than by way of mere increase in bigness. The latter view seems the more fitting and it is certainly the safer.

Mere growth in population has been an important factor in increasing the demand upon industries, and in future it will be less important. Population forecasts based upon extrapolation of curves are reasonably certain to go wrong; but an impressive study recently made by P. K. Whelpton of the Scripps Foundation, Miami University, and printed in the *American Journal of Sociology*, seems reasonably trustworthy. It takes population in detail, so to speak, considering the swing in birth rates and death rates among native whites, foreign whites and colored, urban immigration and other trends. The computed population for 1930 is 123,600,000 and, for 1975, 175,120,000. Industry is more interested in the changing rate. For the table below we have computed the average annual percentage increase in population by decennial periods from 1850, from Census returns, and on to 1970 from the Whelpton figures.

Annual Percentage Increase in Population

1850–60	3.09	1910–20	1.46
1860–70	2.06	1920–30	1.52
1870–80	2.67	1930–40	1.36
1880–90	2.30	1940-50	0.93
1890–1900	1.90	1950-60	0.70
1900–10	1.95	1960-70	0.53

Thus industry will do well to "go in" for cost reduction more than for mere expansion. There is another angle, however. When population increases more slowly there may be more individual prosperity and greater spending power because of there being fewer children to bring up.

Fabricated Structural Steel

Chicago Office Building Takes 8000 Tons of 17,140 Tons Let —Only 8100 in New Projects

WITH 8000 tons for a Chicago office building, awards reported during the week amounted to only 17,140 tons, the lowest total since May, but less than 100 tons under the aggregate of two weeks ago. New projects calling for 8100 tons included no projects of outstanding size. Awards follow:

NEW YORK, 650 tons, Spence School in East Ninety-first Street, to McClintic-Marshall Co.

STATE OF NEW JERSEY, 150 tons, highway bridge, to American Bridge Co.

TOLEDO, OHIO, 1500 tons, building for Ford Plate Glass Co., to McClintic-Marshall Co.

GADSDEN, ALA., 2780 tons, plant for Goodyear Tire & Rubber Co., to McClintic-Marshall Co.

CHICAGO, 8000 tons, No. 1 North LaSalle Building, to American Bridge Co.

MILWAUKEE, 1000 tons, store and garage, to Milwaukee Bridge Co.

KANSAS CITY SOUTHERN, 1100 tons, trestles, to Kansas City Structural Steel Co.

STATE OF MONTANA, 600 tons, bridge across Missouri River, to Missouri Valley Bridge & Iron Works.

PORTLAND, ORE., 100 tons, Trask River bridge, to unnamed company.

SEATTLE, 110 tons, hangar at Boeing Field, to Austin Co.

RENTON, WASH., 650 tons, power house for Puget Sound Power & Light Co., to Pacific Car & Foundry Co.

OAKLAND, CAL., 110 tons, apartment building, Warfield and Glenview Avenues, to Herrick Iron Works.

OAKLAND, 140 tons plates, tanks for Shell Oil Co. to Western Pipe & Steel Co.

SAN RAFAEL, CAL., 250 tons, plates, steel tank for Marin municipal water district, to Steel Tank & Pipe Co.

SPRINGFIELD, MASS., 250 tons, Westinghouse Electric & Mfg. Co. plant unit.

PROVIDENCE, R. I., 200 tons, Rhode Island Insurance Co. building.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD, 125 tons, freight shed at Boston.

NEW YORK, 1200 tons, Loew's Theater in 175th Street.

MALONE, N. Y., 1000 tons, school.

DOVER, N. J., 1000 tons, bridge for New Jersey State Highway Department.

WILKES-BARRE, PA., 500 tons, Wilkes-Barre Hotel.

PENNSYLVANAA RAILROAD, 1300 tons, grade elimination in Ohio; American Bridge Co. and Bethlehem Steel Co., low bidders.

CLEVELAND, 1000 tons, building for Bing Furniture Co.

SOUTH BEND, IND., 450 tons, factory building for John Bamgaurt.

RICHMOND, CAL., 804 tons, car shed for Santa Fe; bids received.

PORTLAND, ORE., 250 tons, Denver Avenue bridge; bids opened.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

Reinforcing Steel

Awards of 4000 Tons—1800 Tons in New Projects

AWARDS of 4000 tons included no jobs of outstanding size. New projects brought out in the last week call for less than 1800 tons. Awards follow:

NEW YORK, 350 tons, section 1, route 104, New York subway, to National Bridge Works, through Triest Contracting Co.

NEWARK, N. J., 800 tons, building for Hoffmann Beverage Co.; from Turner Construction Co., general contractor, to Jones & Laughlin Steel Corporation.

KEARNY, N. J., 220 tons, buildings for Western Electric Co., Inc.; from Austin Co., general contractor, to Joseph T. Ryerson & Son, Inc.

CLEVELAND, 300 tons, plant for Chase Brass & Copper Co., to Pattison-Leitch Co.

CLEVELAND, 165 tons, Moreland Courts Apartments, to Truscon Steel Co.

CHICAGO, 700 tons, office building at 1 North LaSalle Street, to an unnamed bidder.

LOS ANGELES, 385 tons, office building, Eighth and Hill Streets, to Pacific Coast Steel Co.

NEWPORT BEACH, CAL., 113 tons, two bridges, to unnamed interest.

BALLARD, WASH., 100 tons, church, to unnamed company.

SEATTLE, 100 tons, Bekins warehouse, to Pacific Coast Steel Co.

SEATTLE, 300 tons, shopping tower, Third and Pine Streets, to Northwest Steel Rolling Mills.

BELLINGHAM, WASH., 100 tons, building for Washington Cooperative Egg and Poultry Association, to Pacific Coast Steel Co.

PORTLAND, ORE., 400 tons, school, to Pacific Coast Steel Co.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

CAMDEN, N. J., 150 tons, service station.

DAYTON, OHIO, 300 tons, building for Loretta Guild, general contract to H. L. Blagg Co., Dayton.

CHICAGO, 400 tons, apartment building; Lichenko & Esser, architects.

CHICAGO, 200 tons, office building on North Michigan Avenue; Holabird & Roche, architects.

PORTLAND, ORE., 557 tons, Denver Avenue bridge; bids opened.

LOS ANGELES, 180 tons, hotel, 2525 West Sixth Street; bids being taken.

Small Loss in December Pig Iron Output

Estimated Daily Rate of Production Was Less Than in November by 1334 Tons or 1.2 Per Cent—Net Gain of Three Furnaces

FROM telegraphed reports received by THE IRON AGE on Dec. 31 from producers of pig iron in the United States, who estimated their output for the last two or three days of December, the production for that month was 3,371,250 gross tons or 108,750 tons per day. Compared with November this is a loss of 1334 tons per day or 1.2 per cent.

For the year the estimated coke pig iron production was 37,839,208 tons, a gain of 1,606,902 tons or 4.4 per cent over the 36,232,306 tons in 1927.

There were nine furnaces blown in during December and six blown out or banked, a net gain of three. At the end of the month there were 197 furnaces active as compared with 194 on Dec. 1, according to these preliminary returns.

Pig Iron Production by Districts, Gross Tons

	December (31 days)	November (30 days)	October (31 days)	September (30 days)
New York and Massachusetts	200,727	208,651	213,614	183,557
Lehigh Valley	94,250	100,423	96,912	78,272
Schuylkill Valley	55,988	60,185	53,364	51,116
Lower Susq. and Lebanon Valleys	34,300	31,106	31,084	30,680
Pittsburgh district	716,362	747,080	741,363	622,023
Shenango Valley	99,480	99,432	101,787	86,136
Western Pennsylvania	153,824	144,135	146,988	138,021
Maryland, Virginia and Kentucky	109,004	105,444	111,543	113,108
Wheeling district	131,754	133,237	141,727	149,813
Mahoning Valley	327,057	317,439	347,118	309,512
Central and Northern Ohio	341,983	322,405	332,966	328,382
Southern Ohio	43,250	41,203	46,074	45,363
Illinois and Indiana	655,556	615,969	655,022	609,891
Mich., Minn., Mo., Wis., Colo. and Utah	151,208	138,163	125,979	112,030
Alabama	249,744	231,366	222,142	197,367
Tennessee	6,763	6,085	6,123	7,043
Total	3,371,250	3,302,523	3,373,806	3,062,314

Estimated production by districts is given in the accompanying table. Complete data for December and for the year, with comparative figures for preceding years, will be published in THE IRON AGE, Jan. 10.

Railroad Equipment

New York Central Orders 100 Locomotives

OUTSTANDING among the week's purchases was an order for 100 heavy freight engines placed by the New York Central. Important new inquiry included 2000 freight cars for the Chicago & North Western and from 350 to 1100 freight cars for the Wheeling & Lake Erie. The Illinois Central has authorized the purchase of 2700 freight, 25 caboose and 34 passenger cars and 15 switching locomotives. Details of the week's business follow:

Chicago & North Western is inquiring for 1000 70-ton gondola and 1000 automobile cars.

Virginian Railway has ordered 500 60-ton hopper car bodies from Virginia Bridge & Iron Co.

Reading Co. has ordered three double power plant combination passenger baggage and mail, gas-electric rail motor cars from J. G. Brill Co.

Chicago, Indianapolis & Louisville has ordered 10 steel underframe caboose cars from American Car & Foundry Co.

Atchison, Topeka & Santa Fe is inquiring for 14 mail and baggage cars.

Lehigh & New England has ordered repairs to 200 steel hopper cars from American Car & Foundry Co.

Illinois Central has authorized purchase of 2700 freight, 25 caboose and 34 passenger cars and 15 eight-wheel switching locomotives.

Missouri Pacific has ordered 25 eight-wheel switching locomotives from Lima Locomotive Works, Inc., and 20 air-dump cars from Western Wheeled Scraper Co.

Chicago, Burlington & Quincy has awarded six locomotives to Baldwin Locomotive Works.

A foreign railroad has placed four locomotives with Baldwin Locomotive Works.

Tsingtan Tsinan Railroad, China, is inquiring for five 2-8-0 locomotives.

New York Central has ordered 100 heavy freight engines from American Locomotive Co.

Wheeling & Lake Erie is inquiring for from 250 to 1000 70-ton steel gondola cars and 100 steel underframe flat cars.

Union Pacific is inquiring for 25 passenger coaches, 25 baggage cars, five horse, baggage and automobile cars and five dining cars.

Chateaugay Blast Furnace Adopts New Selling Plan

The Chateaugay Ore & Iron Co., with blast furnace at Standish, N. Y., will hereafter sell the output of the furnace largely through its own sales department, and the selling arrangement with Pilling & Co., Philadelphia and New York, who represented the furnace for many years, was terminated as of Dec. 31. The company produces copper-free low phosphorus pig iron.

Ralph W. Clark, formerly New York district sales agent in New York for Pilling & Co., has been elected vice-president and general sales agent of the Chateaugay Ore & Iron Co. and the Chazy Marble Lime Co., both of which are subsidiaries of the Hudson Coal Co., Scranton, Pa., which in turn is owned by the Delaware & Hudson Railroad Co. E. J. Burnes, who for five years was associated with Mr. Clark when the latter was with Pilling & Co., and who for the past year has been with the Semet-Solvay Co., has been appointed assistant general sales agent of Chateaugay and Chazy companies.

Chateaugay iron will be sold direct by the producing company throughout the East, including Buffalo and Pittsburgh, but excepting Cleveland, Massillon and Canton, Ohio. Sales in the Western territory will be handled by Walter Wallingford & Co., Cincinnati and Chicago.

Tennessee to Double Its Fairfield Sheet Capacity

The Tennessee Coal, Iron & Railroad Co., Birmingham, has announced plans for an additional unit at its Fairfield sheet mills which will double the rolling and galvanizing capacity of the mills.

The official announcement made by George Gordon Crawford, president, follows:

"Plans are being prepared for an additional unit of the Fairfield sheet mills, which will double its rolling and galvanizing capacity. The plans contemplate an addition of 12 sheet mills, six of which are expected to be ready for operation in 1929."

This program is additional to changes under way at Fairfield plant as reported on page 84, this issue.

Tutein-Hudson Valley Case Again Postponed

Hearings in arbitration proceedings between E. Arthur Tutein, Inc., Boston, and the Hudson Valley Coke & Products Corporation, Troy, N. Y., have been postponed until March 6. Hearings had previously been postponed from Dec. 17 to Dec. 26, 1928. The case involves an alleged breach of contract for the sale of pig iron and coke.

Iron and Steel Markets

Steel Output to Increase in January

Mill Backlogs Large Despite High December Output— Pig Iron Production Stimulated by Rise in Scrap— World's Record in Steel

WITH steel output holding at 85 per cent as a record-breaking production year comes to a close, still heavier operations are in prospect for January. Twelve months ago increased production was looked for as a compensation for curtailed output in the second half of 1927, and that expectation was fulfilled. Today a gain is foreseen in spite of sustained activity throughout the final months of 1928, which brought an unprecedented total of 50,400,000 tons of ingots for the year, surpassing the previous record reached in 1926 by over 7 per cent.

Current demands on the steel mills are reflected in greater pressure on blast furnaces. Pig iron production in October, November and December was higher than in any preceding month in 1928. In no post-war year except 1922, during the recovery from the 1921 slump, has the last quarter held such a position.

Total pig iron output in December, estimated on the basis of telegraphic returns to THE IRON AGE, was 3,371,250 tons. Average output per day, at 108,750 tons, stood third for the year, registering a decline of 1.2 per cent from the rate of November. A net gain of three active furnaces for the month portends larger production in January.

The year's production of coke pig iron, estimated at 37,839,000 tons, has been exceeded by five previous years. Output for 1928 was held down by increased use of scrap for steel making. Old material, however, grew scarce in the fall, accounting in large part for the fourth quarter rise in blast furnace activity.

The dearth of scrap is still pronounced, and heavy melting steel at Pittsburgh has gone up to $18.75 a ton, or 75c. above the October peak. This increase is expected to result in a stronger pig iron market, since scrap is higher than basic iron in the Valleys and steel companies are depending more and more on their blast furnace metal for steel making.

Steel mill operations quickly recovered from the holiday interruptions. Sheet output is at 90 per cent of capacity, and some mills have order books that will sustain full operations for six weeks. Sheet mill backlogs at Chicago are 25 per cent larger than at this time a year ago. Tin plate mills are operating virtually at capacity, and producers of strip have large backlogs. Mill schedules at Chicago will raise rail output from the present rate of 55 per cent to 80 per cent by the middle of January.

Unfilled tonnages are heavy in products on which price advances were announced for the coming quarter, such as sheets, tin plate, strips and wire products. In lines in which there has been no incentive to anticipate requirements, specifications, on the whole, have been satisfactory, but not so large as to prevent a normal volume of replenishment buying this month. Plate mills at Chicago, as a result of large releases from a maker of electrically welded pipe and demands by tank fabricators and railroad car builders, are more heavily booked than producers farther east. Partly on this account and partly because of the recent change in Eastern basing prices, Pittsburgh quotations on plates, as well as bars and shapes, are easier, ranging from 1.90c. to 1.95c. instead of 1.90c. to 2c.

Railroad buying is featured by an order for 100 heavy freight locomotives by the New York Central and four Western rail purchases totaling 50,000 tons. Pending freight equipment business, augmented by inquiries for 2000 cars for the Chicago & North Western, 350 to 1100 cars for the Wheeling & Lake Erie, and 2700 for the Illinois Central, now totals more than 16,000 cars.

Prospective structural steel work includes 34,000 tons for New York subways, on which bids have been taken, and 25,000 tons for the West Side elevated highway, New York, on which figures will be submitted shortly. The entire highway will require a total of 100,000 tons.

Automobile production promises to show considerable recovery this month. Forge shops doing automotive work are scheduled to operate at capacity.

World steel output, estimated at 107,490,000 tons of ingots and steel castings for 21 countries, made a new record in 1928, exceeding the previous peak tonnage of 1927 by 7.3 per cent. The gain in 1927 was accounted for by foreign production, since American output declined in that year, but in 1928 the reverse was true. This country's share of last year's total was 48 per cent, compared with 44.8 per cent in 1927. The world total for 1928 was 43 per cent larger than that for 1913.

World production of pig iron, at 86,230,000 tons, was also a new record, but showed a gain of only 11 per cent over output for 1913.

November exports of iron and steel products totaled 256,886 tons, the highest figure for any month since 1921. On the basis of shipments of 2,641,000 tons in 11 months, a total of 2,900,000 tons for the past year is indicated.

Both of THE IRON AGE composite prices are unchanged, that for steel at 2.391c. a lb., the high for 1928, and that for pig iron at $18.46 a ton, only 13c. below the year's peak.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics
At Date, One Week, One Month, and One Year Previous

Pig Iron, Per Gross Ton:	Dec. 31, 1928	Dec. 24, 1928	Dec. 4, 1928	Jan. 3, 1928
No. 2, fdy., Philadelphia	$21.26	$21.26	$21.26	$19.76
No. 2, Valley furnace	17.50	17.50	18.00	17.25
No. 2, Southern, Cin'ti	20.19	20.19	20.19	19.69
No. 2, Birmingham	16.50	16.50	16.50	16.00
No. 2 foundry, Chicago*	20.00	20.00	20.00	18.50
Basic, del'd eastern Pa.	19.75	19.75	20.25	19.50
Basic, Valley furnace	17.50	17.50	17.50	17.00
Valley Bessemer, del'd P'gh	20.01	20.01	20.01	19.26
Malleable, Chicago*	20.00	20.00	20.00	18.50
Malleable, Valley	18.00	18.00	18.25	17.50
Gray forge, Pittsburgh	18.76	18.76	19.26	18.51
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	105.00	105.00	105.00	100.00
Rails, Billets, etc., Per Gross Ton:				
O.-h. rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Bess. billets, Pittsburgh	33.00	33.00	33.00	33.00
O.-h. billets, Pittsburgh	33.00	33.00	33.00	33.00
O.-h. sheet bars, P'gh	33.00	33.00	33.00	34.00
Forging billets, P'gh	38.00	38.00	38.00	38.00
O.-h. billets, Phila	38.30	38.30	38.30	38.30
Wire rods, Pittsburgh	42.00	42.00	42.00	40.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb	1.90	1.90	1.90	1.80
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia	2.12	2.12	2.12	2.12
Iron bars, Chicago	2.00	2.00	2.00	1.90
Steel bars, Pittsburgh	1.90	1.90	1.90	1.80
Steel bars, Chicago	2.00	2.00	2.00	1.90
Steel bars, New York	2.24	2.24	2.24	2.14
Tank plates, Pittsburgh	1.90	1.90	1.90	1.80
Tank plates, Chicago	2.00	2.00	2.00	1.90
Tank plates, New York	2.17½	2.17½	2.22½	2.12½
Beams, Pittsburgh	1.90	1.90	1.90	1.80
Beams, Chicago	2.00	2.00	2.00	1.90
Beams, New York	2.14½	2.14½	2.19½	2.09½
Steel hoops, Pittsburgh	2.10	2.10	2.10	2.20

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Sheets, Nails and Wire,	Dec. 31, 1928	Dec. 24, 1928	Dec. 4, 1928	Jan. 3, 1928
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh	2.85	2.85	2.75	2.80
Sheets, black, No. 24, Chicago dist. mill	2.95	2.95	2.85	2.90
Sheets, galv., No. 24, P'gh	3.60	3.60	3.50	3.65
Sheets, galv., No. 24, Chicago dist. mill	3.70	3.70	3.60	3.70
Sheets, blue, 9 & 10, Pittsburgh	2.10	2.10	2.00	2.10
Sheets, blue, 9 & 10, Chicago dist. mill	2.20	2.20	2.10	2.15
Wire nails, Pittsburgh	2.65	2.65	2.55	2.50
Wire nails, Chicago dist. mill	2.70	2.70	2.60	2.55
Plain wire, Pittsburgh	2.50	2.50	2.40	2.40
Plain wire, Chicago dist. mill	2.55	2.55	2.45	2.45
Barbed wire, galv., Pittsburgh	3.30	3.30	3.20	3.20
Barbed wire, galv., Chicago dist. mill	3.35	3.35	3.25	3.25
Tin plate, 100 lb. box, P'gh	$5.35	$5.25	$5.25	$5.25
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	$18.75	$18.25	$17.00	$15.50
Heavy melting steel, Phila	16.00	16.00	15.00	13.50
Heavy melting steel, Ch'go	14.75	14.50	14.50	12.50
Carwheels, Chicago	14.00	14.00	14.25	13.50
Carwheels, Philadelphia	16.50	16.50	16.50	15.50
No. 1 cast, Pittsburgh	16.00	14.50	14.50	14.50
No. 1 cast, Philadelphia	16.25	16.25	16.25	16.00
No. 1 cast, Ch'go (net ton)	15.75	15.75	15.50	14.00
No. 1 RR. wrot., Phila	15.50	15.50	15.50	15.25
No. 1 RR. wrot., Ch'go (net)	13.25	13.25	13.25	11.00
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.75	$2.75	$2.75	$2.75
Foundry coke, prompt	3.75	3.75	3.75	3.75
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	16.62½	16.12½	16.12½	14.25
Electrolytic copper, refinery	16.25	15.75	15.75	13.75
Zinc, St. Louis	6.35	6.35	6.35	5.65
Zinc, New York	6.70	6.70	6.70	6.00
Lead, St. Louis	6.35	6.35	6.32½	6.30
Lead, New York	6.50	6.50	6.50	6.50
Tin (Straits), New York	50.12½	49.62½	52.50	57.75
Antimony (Asiatic), N. Y.	9.87½	9.75	10.00	11.00

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Pittsburgh

Mills Well Supplied With January Shipping Orders—Scrap Prices Still Rising

PITTSBURGH, Dec. 31.—Steel rolling mill operations have snapped back quickly from the interruption occasioned by the observance of Christmas, and the outlook is for an exceptionally high rate of mill engagement for the first month of the new year, as shipping orders are heavy in sheets, tin plate, rails, strips and wire products and are good in all other finished products with the possible exception of pipe. The lull that usually marks the period from about the middle of December through the first two weeks of January is not in evidence.

To escape price advances, distributers of wire products have been specifying freely on old, low-priced commitments, and mills in this area report enough specified tonnage to insure a very full operation throughout the first month of 1929, regardless of whether there is much specifying on first quarter contracts, which, it is said, are being signed with a minimum of resistance on the part of buyers. An excellent order book in sheets also is partly explained by heavy tonnage releases, inspired by a desire to avoid an advance of $2 a ton, which was imposed in formal first quarter contracts. Makers also have been getting a good many contracts for that period, but it probably will be a week or two before specifying against them gathers much force.

Container manufacturers, expecting 1929 to be a record year in the packing of fruits, vegetables and other perishable foods, have not been backward in letting the mills know of their probable tin plate requirements, and that information enables the makers to schedule their mills at a high rate, although actual shipments in January, February and March rarely are as heavy as those a little later in the year. Strip steel makers appear to have taken considerable business and are going into the new year with a good-sized carryover from the final quarter of 1928. Rail tonnage of the local mill is not quite as heavy as it was a year ago, but is sufficient to provide full operation.

Ingot production keeps up to its recent rate of around 80 per cent for this and nearby districts, and the prospect is for an early increase, since automotive requirements are expected to continue to expand; no material contraction has occurred in the consumptive channels that contributed so much to the record output of 1928 and to that demand must be added the increased business in steel for railroad rolling stock.

Steel prices are slow to reflect the high rate of plant operations. Sheets appear to be holding the advance announced for the first quarter, and there is little resistance to the higher prices on wire products. Real strength is absent in strips, while on bars, plates and shapes, 1.90c. to 1.95c. is more representative of the market than 1.90c. to 2c., base Pittsburgh. The recent change in the Eastern basing prices is not without effect upon local mill prices of plates and shapes.

Scrap prices continue to advance,

with sales noted of both heavy melting steel and of compressed sheets at $19. Pig iron is firmly held, but is not active enough to become quotably higher.

Pig Iron.—Merchant producers continue to derive confidence from the continued upward tendency in scrap prices, in which they see the possibility of increased use of pig iron instead of scrap and consequently of reduced steel company competition in merchant iron. But putting up pig iron prices appears to wait for evidence of interest in supplies on the part of melters. Just now there is very little such interest, probably because most of the important consumers are covered through January and in many cases through the first quarter. Scrap has had a good deal greater rise in this market than has pig iron in the past six months, and there has been some wondering if the former relationship between prices of the two commodities has been broken. It probably has, at least temporarily, and the reason presumably is in the fact that liquidation of reserve stocks has not only been more rapid but more complete in scrap than in pig iron. There is no occasion to change pig iron prices. The Shenango Furnace Co. will blow in its No. 3 furnace late this week.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$17.50
Bessemer	$18.25 to 18.50
Gray forge	17.00 to 17.50
No. 2 foundry	17.50 to 18.00
No. 3 foundry	17.00 to 17.50
Malleable	18.00 to 18.50
Low phos., copper free	26.50 to 27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Semi-Finished Steel.—Movement of sheet bars still is heavy, but almost entirely on fourth quarter contracts carrying $33, instead of $34, Pittsburgh or Youngstown, the first quarter price. Sheet and tin plate mills are busy and that is another reason for good specifications. Strip makers, being well supplied with orders, are taking out billets and slabs freely.

Bars, Plates and Shapes.—Great difficulty is experienced in selling carload lots at more than 1.95c., and the market is quotable at 1.90c. to 1.95c., base Pittsburgh. It is doubtful if desirable plate orders command more than 1.90c., as the passing of so much of the large pipe business to the Central West has deprived local mills of tonnage.

Warehouse Prices, f.o.b. Pittsburgh

	Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.60c.
Hoops	4.00c. to 4.50c.
Black sheets (No. 24), 25 or more bundles	3.70c.
Galv. sheets (No. 24), 25 or more bundles	4.55c.
Blue ann'l'd sheets (No. 10), 1 to 10 sheets	3.35c.
Galv. corrug. sheets (No. 28), per square	$4.43
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	60 per cent off list
Machine bolts, 100 count,	60 per cent off list
Carriage bolts, 100 count,	60 per cent off list
Nuts, all styles, 100 count,	60 per cent off list
Large rivets, base per 100 lb.	$3.50
Wire, black soft ann'l'd, base per 100 lb	$3.00 to 3.10
Wire, galv. soft, base per 100 lb.	3.00 to 3.10
Common wire nails, per keg	3.00
Cement coated nails, per keg	3.05

Rails and Track Supplies.—The railroads have not yet begun to order or specify track accessories with any considerable freedom. Prices appear to be holding well. Rail production is heavy and shipments are gaining.

Wire Products.—Buyers are supplying a good many of their January requirements from shipments on fourth quarter contracts, but they are signing up fairly freely for first quarter despite the advance of $2 a ton announced about 30 days ago.

Tubular Goods.—Lapwelded pipe is very dull; seamless pipe appears to have largely supplanted it in the sizes 8 in. and under, while in the larger diameters electrically welded pipe has cut in sharply. The leading maker of the latter is understood to have fabricated 180,000 tons in the first seven months of this year and recently reported an order book amounting to 170,000 tons. Buttwelded pipe is moderately active, and some increase is noted in the demand for tubes from the motor car industry. There is a steady demand for boiler tubes.

Sheets.—Mill obligations are sufficient to provide a 90 per cent operation. The automotive industry is releasing tonnage fairly freely, but the important recent development has been a substantial gain in sheets for railroad cars. Deviations from quoted prices are few.

Tin Plate.—Practically full engagement of economically operated capacity marks the opening of the new year. Can companies are planning for the greatest canning year in history and are letting their wants become known earlier than usual.

Cold-Finished Steel Bars.—Almost all consumers are under contract for the first quarter. Current shipments are on a rising scale in keeping with the larger requirements of the motor car builders.

Hot-Rolled Flats. — Makers still have some fourth quarter tonnage to work off before they can profit much from the higher prices named on first quarter business. This condition probably accounts for the lack of real strength in prices.

Cold-Rolled Strips.—Order books are good and specifications are heavy enough to warrant almost full engagement of capacity. There are few deviations from the regular market price of 2.85c., base Pittsburgh or Cleveland.

Coke and Coal.—The fact that the No. 3 furnace of the Shenango Furnace Co., Sharpsville, Pa., will be blown in late this week has occasioned no stir in the spot furnace coke market, although the company for the present is depending upon such offerings. The supply still is too great for the demand, and while $2.75 per net ton at ovens still is the ruling price, the market is weak at that figure, which probably would be shaded on worth-while tonnages. Spot offerings of foundry coke also are ample for the demand and prices no more

The Iron Age Composite Prices

Finished Steel

Dec. 31, 1928, 2.391c. a Lb.

One week ago	2.391c.
One month ago	2.362c.
One year ago	2.314c.
10-year pre-war average	1.689c.

Based on steel bars, beams tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High		Low	
1928	2.391c.,	Dec. 11;	2.314c.,	Jan. 3
1927	2.453c.,	Jan. 4;	2.293c.,	Oct. 25
1926	2.453c.,	Jan. 5;	2.403c.,	May 18
1925	2.560c.,	Jan. 6;	2.396c.,	Aug. 18
1924	2.789c.,	Jan. 15;	2.460c.,	Oct. 14
1923	2.824c.,	Apr. 24;	2.446c.,	Jan. 2

Pig Iron

Dec. 31, 1928, $18.46 a Gross Ton

One week ago	$18.46
One month ago	18.59
One year ago	17.54
10-year pre-war average	15.72

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High		Low	
1928	$18.59,	Nov. 27;	$17.04,	July 24
1927	19.71,	Jan. 4;	17.54,	Nov. 1
1926	21.54,	Jan. 5;	19.46,	July 13
1925	22.50,	Jan. 13;	18.96,	July 7
1924	22.88,	Feb. 26;	19.21,	Nov. 3
1923	30.86,	Mar. 20;	20.77,	Nov. 20

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.90c. to 1.95c.
F.o.b. Chicago	2.00c. to 2.10c.
Del'd Philadelphia	2.22c. to 2.32c.
Del'd New York	2.24c. to 2.34c.
Del'd Cleveland	1.92½c. to 1.95c.
F.o.b. Cleveland	1.90c. to 1.95c.
F.o.b. Lackawanna	2.00c. to 2.10c.
F.o.b. Birmingham	2.15c.
C.i.f. Pacific ports	2.35c.
F.o.b. San Francisco mills	2.35c. to 2.40c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills, 40, 50 and 60-ft. lengths	2.00c.
F.o.b. Pittsburgh mills, cut lengths	2.25c.
F.o.b. Birmingham	2.15c.

Rail Steel

F.o.b. mills east of Chicago dist.	1.85c. to 1.95c.
F.o.b. Chicago Heights mill	1.95c.

Iron

Common iron, f.o.b. Chicago	2.00c. to 2.10c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.12c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.90c. to 1.95c.
F.o.b. Chicago	2.00c. to 2.10c.
F.o.b. Birmingham	2.15c.
Del'd Cleveland	2.09c. to 2.19c.
Del'd Philadelphia	2.10c. to 2.20c.
F.o.b. Coatesville	2.00c. to 2.10c.
F.o.b. Sparrows Point	2.00c. to 2.10c.
F.o.b. Lackawanna	2.00c. to 2.10c.
Del'd New York	2.17½c. to 2.27½c.
C.i.f. Pacific ports	2.20c. to 2.30c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.90c. to 1.95c.
F.o.b. Chicago	2.00c. to 2.10c.
F.o.b. Birmingham	2.15c.
F.o.b. Lackawanna	2.00c. to 2.10c.
F.o.b. Bethlehem	2.00c. to 2.10c.
Del'd Cleveland	2.09c. to 2.19c.
Del'd Philadelphia	2.06c. to 2.16c.
Del'd New York	2.14½c. to 2.24½c.
C.i.f. Pacific ports	2.35c.

Hot-Rolled Flats (Hoops, Bands and Strips)

	Base per Lb.
6 in. and narrower, P'gh	1.90c.
Wider than 6 in., P'gh	1.80c.
6 in. and narrower, Chicago	2.10c.
Wider than 6 in., Chicago	2.00c.
Cooperage stock, P'gh	2.10c.
Cooperage stock, Chicago	2.20c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.20c.
Bars, f.o.b. Chicago	2.20c.
Bars, Cleveland	2.25c.
Shafting, ground, f.o.b. mill	*2.55c. to 3.50c.
Strips, P'gh	2.85c.
Strips, Cleveland	2.85c. to 2.95c.
Strips, del'd Chicago	3.15c. to 3.25c.
Strips, Worcester	3.00c.
Fender stock, Pittsburgh or Cleveland	4.25c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland, to jobbers and retailers.)

	Base per Keg
Wire nails	$2.65 to $2.75
Galvanized nails	4.65 to 4.75
Galvanized staples	3.35 to 3.45
Polished staples	3.10 to 3.20
Cement coated nails	2.65 to 2.75

	Base per 100 Lb.
Bright plain wire, No. 6 to No. 9 gage	$2.50 to $2.60
Annealed fence wire	2.65 to 2.75
Spring wire	3.50 to 3.60
Galv'd wire, No. 9	3.10 to 3.20
Barbed wire, galv'd	3.30 to 3.40
Barbed wire, painted	3.05 to 3.15

Chicago district mill and delivered Chicago prices are $1 per ton above the foregoing. Birmingham mill prices $3 a ton higher; Worcester Mass., (wire) mill $3 a ton higher on production of that plant; Duluth, Minn., mill $2 a ton higher; Anderson, Ind., $1 higher.

Cut Nails

	Per 100 Lb.
Carloads, Wheeling, W. Va., or Reading, Pa.	$2.70
Less carloads, Wheeling or Reading	2.80

Woven Wire Fence

Base to Retailers per Net Ton

F.o.b. Pittsburgh	$65.00
F.o.b. Cleveland	65.00
F.o.b. Anderson, Ind	66.00
F.o.b. Chicago district mills	67.00
F.o.b. Duluth	68.00
F.o.b. Birmingham	68.00

Sheets

Blue Annealed

	Base per Lb.
Nos. 9 and 10, f.o.b. P'gh	2.10c.
Nos. 9 and 10, f.o.b. Chicago dist.	2.20c.
Nos. 9 and 10, del'd Cleveland	2.29c.
Nos. 9 and 10, del'd Philadelphia	2.42c.
Nos. 9 and 10, f.o.b. Birmingham	2.25c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.85c.
No. 24, f.o.b. Chicago dist. mill	2.95c.
No. 24, del'd Cleveland	3.04c.
No. 24, del'd Philadelphia	3.17c.
No. 24, f.o.b. Birmingham	3.00c.

Metal Furniture Sheets

No. 24, f.o.b. P'gh, No. 1 grade	4.00c.
No. 24, f.o.b. P'gh, No. 2 grade	3.80c.

Galvanized

No. 24, f.o.b. Pittsburgh	3.60c.
No. 24, f.o.b. Chicago dist. mill	3.70c.
No. 24, del'd Cleveland	3.79c.
No. 24, del'd Philadelphia	3.92c.
No. 24, f.o.b. Birmingham	3.75c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	3.00c.
No. 28, f.o.b. Chicago dist. mill	3.00c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	4.10c.

Long Ternes

No. 24, 8-lb. coating, f.o.b. mill	4.00c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.90c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.35
Standard cokes, f.o.b. Gary	5.45

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$11.20
15-lb. coating I.C.	14.00
20-lb. coating I.C.	15.30
25-lb. coating I.C.	$16.70
30-lb. coating I.C.	17.75
40-lb. coating I.C.	19.85

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quality Bar Base, 2.65c. to 2.75c. per Lb.

S.A.E. Series Numbers		Alloy Differential	Net Price 100 Lb. Bars
2000	(½% Nickel)	$0.25	$3.00
2100	(1½% Nickel)	0.55	3.30
2300	(3½% Nickel)	1.50	4.25
2500	(5% Nickel)	2.25	5.00
3100	Nickel Chromium	0.55	3.30
3200	Nickel Chromium	1.35	4.10
3300	Nickel Chromium	3.80	6.55
3400	Nickel Chromium	3.20	5.96
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50	3.25
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70	3.45
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05	3.80
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35	3.10
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45	3.20
5100	Chromium Spring Steel	0.20	2.95
6100	Chromium Vanadium Bars	1.20	3.95
6100	Chromium Vanadium Spring Steel	0.95	3.70
9250	Silicon Manganese Spring Steel (flats)	0.25	3.00
	Rounds and squares	0.50	3.25
	Chromium Nickel Vanadium	1.50	4.25
	Carbon Vanadium	0.95	3.70

Above prices are for hot-rolled steel bars, forging quality. The ordinary differential for cold-drawn bars is ¾c. per lb. higher. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis. For billets under 4 x 4 down to and including 2½ in. squares, the price is $5 a gross ton above the 4 x 4 billet price.

Slabs with sectional area of 16 in. or over carry the billet price; slabs with sectional area of 12 in. to 16 in. carry a $5 extra above the billet price and slabs with a sectional area under 12 in. carry the bar price.

Band sizes are 40c. per 100 lb. higher.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	36.00
Light (from rail steel), f.o.b. mill	34.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, 9/16 in. and larger	$2.80
Spikes, ½ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plates, steel	2.15
Angle bars	2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Steel Black	Steel Galv.	Iron Inches	Iron Black	Iron Galv
⅛	45	19½	¼ to ⅜	+11	+39
¼ to ⅜	51	25½	½	22	2
½	56	42½	¾	28	11
¾	60	48½	1 to 1½	30	18
1 to 3	62	50½			

Lap Weld

2	55	43½	2	23	7
2½ to 6	59	47½	2½	26	11
7 and 8	56	43½	3 to 6	28	13
9 and 10	54	42½	7 to 12	26	11
11 and 12	53	40½			

Butt Weld, extra strong, plain ends

⅛	41	24½	¼ to ⅜	+19	+54
¼ to ⅜	47	30½	½	21	17
½	53	42½	¾	28	12
¾	58	47½	1 to 1½	30	14
1 to 1½	60	49½			
2 to 3	61	50½			

Lap Weld, extra strong, plain ends

2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 to 8	52	39½	7 to 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	40	1½ in.	1
2½ in.—2¾ in.	48	1¾ in.	8
3 in.	54	2 in.—2¼ in.	13
3¼ in.—3¾ in.	56	2½ in.—2¾ in.	16
4 in.	59	3 in.	17
4½ in. to 6 in.	48	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

Beyond the above base discounts two fives are being quoted on carload lots of lap-welded steel tubes.

On charcoal iron boiler tubes the base discount is subject to 10 per cent preferential discount on full carload shipments.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	63	3 in.	48
1¼ to 1½ in.	55	3¼ to 3½ in.	50
1¾ in.	39	4 in.	53
2 to 2¼ in.	34	4½, 5 and 6 in.	42
2½ to 2¾ in.	42		

Hot Rolled

2 and 2¼ in.	40	3¼ to 3½ in.	56
2½ and 2¾ in.	48	4 in.	59
3 in.	54	4½, 5 and 6 in.	48

Less carload, 4 points less. Add $8 per net ton for more than four gages heavier than standard. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage to be held at mechanical tubes list and discount. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30%, base (carloads)	55
Carbon, 0.30% to 0.40%, base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

than steady. There is no improvement in the coal market.

Old Material.—Steel works grades still are moving higher in price, although consumer interest in the market as typified by purchases is slight. One steel maker in this district has been a buyer of heavy melting steel and compressed sheet scrap, paying up to $19 for both grades. Purchases in the past week by this interest amount to between 5000 and 6000 tons and prices ranged from $18.50 to $19. Strength in other steel works grades is sympathetic, although a paucity of offerings has contributed. Cast cupola size scrap becomes more valuable as a result of the rise in heavy breakable cast than because of purchases by foundries.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
Heavy melting steel	$18.50 to $19.00
Scrap rails	18.00 to 18.50
Compressed sheet steel	18.50 to 19.00
Bundled sheets, sides and ends	17.00 to 17.50
Cast iron carwheels	15.00 to 15.50
Sheet bar crops, ordinary	19.00 to 19.50
Heavy breakable cast	15.00 to 15.50
No. 2 railroad wrought	18.50 to 19.00
Hvy. steel axle turnings	16.00 to 16.50
Machine shop turnings	11.50 to 12.00
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	19.50
Railr. coil and leaf springs	19.50
Rolled steel wheels	19.50
Low phos. billet and bloom ends	22.00 to 22.50
Low phos., mill plates	20.50 to 21.00
Low phos., light grades	19.50 to 20.00
Low phos., sheet bar crops	20.50 to 21.00
Heavy steel axle turnings	16.00 to 16.50
Electric Furnace Grades:	
Low phos. punchings	19.50 to 20.00
Hvy. steel axle turnings	16.00 to 16.50
Blast Furnace Grades:	
Short shoveling steel turnings	12.00 to 12.50
Short mixed borings and turnings	12.00 to 12.50
Cast iron borings	12.00 to 12.50
Rolling Mill Grades	
Steel car axles	21.00 to 22.00
No. 1 railroad wrought	14.50 to 15.50
Sheet bar crops	20.00 to 20.50
Cupola Grades	
No. 1 cast	16.00 to 16.50
Rails 3 ft. and under	20.00 to 20.50

The Machine Products Co., East 179th Street and St. Clair Avenue, Cleveland, maker of cut gears and splined shafts, on Jan. 1, changed its name to the Ohio Gear Co. Business will continue as before and company will also handle stock gears and speed reducers.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel	2.35c.
Reinforc'g bars, rail steel	2.05c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Bands (1/4 in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	3.80c.
Galv. sheets (No. 24)	4.65c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes, stand. railroad	3.55c.
Track bolts	4.55c.
Rivets, structural	3.60c.
Rivets, boiler	3.60c.
	Per Cent Off List
Machine bolts	60
Carriage bolts	60
Coach or lag screws	60
Hot-pressed nuts, sq., tap. or blank	60
Hot-pressed nuts, hex., tap. or blank	60
No. 8 black ann'l'd wire, per 100 lb.	$3.30
Com. wire nails, base per keg	3.20
Cement c't'd nails, base per keg	3.20

Chicago

Steel Mills Start New Year with Schedules That Promise Ascending Rate of Operations

CHICAGO, Dec. 31.—Sales of steel products in this district again bulk large, and the year closes with shipments estimated at from 15 to 20 per cent above those of 1926, which was the previous peak year. The new year starts with ingot output at 85 per cent of capacity. Specifications for various products and rail rolling schedules forecast an increased rate by the middle of January.

The year 1928 brought larger profits to steel producers than the previous year, and prices are generally at a higher level now than at the beginning of 1928.

The holiday period has had less effect on business than in a number of years past, this being reflected in the output of steel and the fact that producers are holding year-end shutdowns to a minimum.

Plate mills are heavily scheduled, though releases for car steel are small. This situation exists because of heavy requirements of welded pipe makers and large tank fabricators. Specifications expected by sellers from car shops promise to push deliveries beyond the present three to four weeks' period.

Pig Iron.—Shipping orders for pig iron, which dropped off somewhat prior to the holiday period, have rebounded sharply, and sellers start the new year with heavy releases on hand. Sales are in small volume, but prices for Northern foundry iron are firm at $20, f.o.b. local furnaces.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$20.00
N'th'n No. 1 fdy., sil. 2.25 to 2.75	20.50
Malleable, not over 2.25 sil	20.00
High phosphorus	20.00
Lake Super. charcoal, sil. 1.50	27.04
So'th'n No. 2 fdy. (all rail)	$22.51 to 23.01
Low phos., sil. 1 to 2, copper free	29.50
Silvery, sil. 8 per cent	30.79
Bess. ferrosilicon, 14-15 per cent	47.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Ferroalloys.—This market is quiet except from the viewpoint of specifications. Prices are steady.

Prices delivered Chicago: 80 per cent ferromanganese, $112.56; 50 per cent ferrosilicon, $83.50 to $88.50; spiegeleisen, 19 to 21 per cent, $40.76.

Bolts, Nuts and Rivets.—Specifications for these commodities have turned sharply upward, and producers are again busily engaged in filling orders rather than expanding stocks.

Reinforcing Bars.—This market is quiet, with little prospect that renewed activity will begin before the middle of January. It is reported that 700 tons of bars has been placed for a building at 1 North LaSalle Street, Chicago. Prices, at 2.35c. per lb. for billet steel reinforcing bars and 2.05c. for the rail steel product, are holding.

Cold-Rolled Strips.—Buyers have made heavy commitments for the first quarter. Specifications have been issued freely and larger shipments will go forward in the early part of January.

Wire Products.—Specifications from the manufacturing trade are heavy and promise large shipments soon after the holiday period. Jobbers are also releasing more liberally as a result of a substantial late fall demand and because their stocks are generally low and broken. Forward contracting has assumed larger proportions, and producers go into the new year with order books larger by a fair margin than a year ago. Prices are steady. Output stands at 62 per cent of capacity.

Sheets.—Most of Chicago's hot mills are down for extensive repairs over the holiday season. It is probable that production will be resumed on Jan. 2. Specifications on makers' books are fully 25 per cent heavier than in the final week of December a year ago. Contracting is sluggish, partly for the reason that a round tonnage of sheets will be shipped in January against contracts entered for the fourth quarter. The roofing trade remains quiet, but makers of light tanks are a trifle busier. Prices are steady at 3c. per lb., Chicago, for black sheets, 3.75c. for galvanized and 2.25c. for blue annealed.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 3.00c.; No. 24 galv., 3.75c.; No. 10 blue ann'l'd, 2.25c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Cast Iron Pipe.—Bids opened at Milwaukee on 9000 tons of cast iron pipe disclosed prices as follows: United States Cast Iron Pipe & Foundry Co., $43.90 a ton, delivered, on all sizes; American Cast Iron Pipe Co., $45.50 on all sizes; Lynchburg Foundry Co., $43.60 on the 16-in. pipe; James B. Clow & Sons, $43.70 on the 8 and 16-in. pipe. The bid by the United States company figures back to $35.40 a ton, Birmingham. Inquiry is light from most buyers except public utilities, which are in need of about 3000 tons. A few carlot sales have been made at $38 a ton, Birmingham.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $43.70 to $46.20; 4-in., $47.70 to $50.20; Class A and gas pipe, $4 extra.

Plates.—Demands from makers of welded pipe and fabricators of large tanks are keeping local plate mills busy at a rate of output fully 50 per cent heavier than a year ago. Two large orders for tanks have been placed with shops, but the orders for steel have not reached mills. Several

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4 in. and under 10 in., Pittsburgh	$33.00
Rerolling, 4 in. and under 10 in., Youngstown	33.00
Rerolling, 4 in. and under 10 in., Cleveland	$33.00 to 34.00
Rerolling, 4 in. and under 10 in., Chicago	35.00
Forging quality, Pittsburgh	38.00

Sheet Bars

(Open hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$33.00 to $34.00
Youngstown	33.00 to 34.00
Cleveland	33.00 to 34.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$33.00
Youngstown	33.00
Cleveland	$33.00 to 34.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.90c. to 2.00c.
Universal	1.90c. to 2.00c.
Sheared	1.90c. to 2.00c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$42.00
Cleveland	42.00
Chicago	43.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.55
Old range non-Bessemer, 51.50% iron	4.40
Mesabi Bessemer, 51.50% iron	4.40
Mesabi non-Bessemer, 51.50% iron	4.25
High phosphorus, 51.50% iron	4.15

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algerian	10.00c.
Iron ore, low phos., Swedish, average 68% iron	10.00c.
Iron ore, basic Swedish, average 65% iron	9.00c.
Manganese ore, washed, 52% manganese, from the Caucasus	36c. to 38c.
Manganese ore, Brazilian, African or Indian, basic 50%	35c. to 37c.
Tungsten ore, high grade, per unit, in 60% concentrates	$11.40 to $12.00

	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantic seaboard	$22.00 to $24.00

	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.75
Foundry, f.o.b. Connellsville prompt	$3.50 to 4.85
Foundry, by-product, Ch'go ovens	8.00
Foundry, by-product, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, ¾-in., f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	70c. to 80c.
Gas slack, f.o.b. W. Pa. mines	90c. to 1.00

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$105.00
Foreign, 80%, Atlantic or Gulf port, duty paid	105.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$31.00 to $34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

	Per Gross Ton Furnace		Per Gross Ton Furnace
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	45.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
10%	$31.00	12%	$35.00
11%	33.00		

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
6%	$24.00	10%	$29.00
7%	25.00	11%	31.00
8%	26.00	12%	33.00
9%	27.00		

Other Ferroalloys

Ferrotungsten, per lb., contained metal del'd	98c. to $1.05
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$200.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silica, gravel, f.o.b. Illinois and Kentucky mines	$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$18.00 to 19.00
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works: High-Heat Duty Brick	Intermediate Heat Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	70
†Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅝ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages, Pittsburgh	80, 10 and 5
Stove bolts in packages, Chicago	80, 10 and 5
Stove bolts in bulk, Pittsburgh	80, 10, 5 and 2½
Stove bolts in bulk, Chicago	80, 10, 5 and 2½
Tire bolts	60, 5 and 5

Discounts of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55 to 60 per cent apply.

Large Rivets

(½-In. and Larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.90
F.o.b. Chicago	3.00

Small Rivets

(⅞-In. and Smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago	70 and 10

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10 and 5
Milled standard set screws, case hardened,	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread	85
Upset hex. cap screws, S.A.E. thread	85
Upset set screws	80, 10 and 5
Milled studs	70

tank projects of noteworthy size are taking shape. Specifications from car builders total 5000 tons, the largest in weeks, and fresh purchases of steel for car building purposes are not less than 4000 tons. Deliveries range from three to four weeks, but recent purchases of welded pipe, plus the expanding needs of car builders, promise to extend delivery dates. Prices are steady at 2c. to 2.10c. per lb., Chicago. The Great Northern has arranged a schedule to rebuild in its own shops 2500 box cars, 500 automobile cars, 25 cabooses and 10 locomotive tenders. More than 63,000 tons of steel will be needed for cars now being sought by the Illinois Central and Chicago & North Western Railroads.

Mill prices on plates, per lb.: 2c. to 2.10c. base Chicago.

Bars.—Sales of mild steel bars are heavy, totaling for the week more than 65,000 tons. Specifications are holding to the December rate and are fully equal to production, which is close to the capacity of local mills. Drop forgers, automobile builders and manufacturers of agricultural machinery are among the users taking larger tonnages. Total specifications in December were a trifle heavier than those of November, and were far ahead of those of the twelfth month a year ago. Deliveries range from four to six weeks. Three leading automobile manufacturers have made large purchases of alloy steel bars and have entered specifications in full. The rail steel bar market is quiet, but specifications for delivery after the turn of the year bulk large. Prices are firm at 1.95c. per lb., Chicago Heights.

Mill prices per lb.: Soft steel bars, 2c. to 2.10c., base, Chicago; common bar iron, 2c. to 2.10c., base, Chicago; rail steel bars, 1.95c., base, Chicago Heights mill.

Rails and Track Supplies.—It is reported that the Chicago & North Western rail orders, totaling about 50,000 tons for 1929, lack only the formality of signatures. In addition, three Western railroads have closed for a total of 10,000 tons of standard-section rails. Output at local mills remains at 55 per cent of capacity, but schedules now arranged promise an 80 per cent rate about the middle of January. A copper mining company has ordered 300 tons of light rails. A large volume of track accessory inquiry is before the trade. In this total is 3000 tons of angle bars, 9500 kegs of spikes and 3600 tons of tie plates for the Pennsylvania.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.15c.; angle bars, 2.75c.

Structural Material.—Awards total 11,000 tons in a market that is unusually quiet in view of the size of the pending list. Shops have orders that will keep them well engaged in January, but there is a lack of balance between large and small contracts, with the result that schedules are difficult to arrange. Deliveries of structural material from Chicago mills are prompt.

Mill prices on plain material, per lb.: 2c. to 2.10c. base, Chicago.

Old Material.—The Chicago scrap market is stronger under the influence of continued heavy shipments, a slight scarcity in a few grades and strengthening of markets to the east. Recent sales have established heavy melting steel at $15.25 a gross ton delivered, an advance of 25c. a ton. Dealers, in filling contracts, are paying $15 to $15.25 a ton, delivered, for this grade. Shipments to melters are unusually well sustained.

Prices deliv'd Chicago district consumers:

Per Gross Ton

Basic Open-Hearth Grades:	
Heavy melting steel	$14.75 to $15.25
Shoveling steel	14.75 to 15.25
Frogs, switches and guards, cut apart, and misc. rails	15.75 to 16.25
Hydraul. compressed sheets	13.00 to 13.50
Drop forge flashings	10.50 to 11.00
Forg'd, cast and r'l'd steel carwheels	18.00 to 18.50
Railr'd tires, charg. box size	17.75 to 18.25
Railr'd leaf spring cut apart	17.75 to 18.25
Acid Open-Hearth Grades:	
Steel couplers and knuckles	16.00 to 16.50
Coil springs	18.25 to 18.75
Electric Furnace Grades:	
Axle turnings	14.50 to 15.00
Low phos. punchings	16.75 to 17.25
Low phos. plate, 12 in. and under	16.50 to 17.00
Blast Furnace Grades:	
Axle turnings	12.00 to 12.50
Cast iron borings	12.00 to 12.50
Short shoveling turnings	12.00 to 12.50
Machine shop turnings	8.00 to 8.50
Rolling Mill Grades:	
Iron rails	15.00 to 15.50
Rerolling rails	17.00 to 17.50
Cupola Grades:	
Steel rails less than 3 ft.	17.25 to 17.75
Steel rails less than 2 ft.	18.75 to 19.25
Angle bars, steel	16.50 to 17.00
Cast iron carwheels	14.00 to 14.50
Malleable Grades:	
Railroad	17.75 to 18.25
Agricultural	13.00 to 13.50
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.	26.00 to 31.00

Per Net Ton

Rolling Mill Grades:	
Iron angles and splice bars	14.50 to 15.00
Iron arch bars and transoms	20.50 to 21.00
Iron car axles	26.50 to 27.00
Steel car axles	16.00 to 16.50
No. 1 railroad wrought	13.25 to 13.75
No. 2 railroad wrought	13.25 to 13.75
No. 1 busheling	11.50 to 12.00
No. 2 busheling	6.00 to 6.50
Locomotive tires, smooth	13.25 to 13.75
Pipes and flues	9.50 to 10.00
Cupola Grades:	
No. 1 machinery cast	15.75 to 16.25
No. 1 railroad cast	15.00 to 15.50
No. 1 agricultural cast	14.50 to 15.00
Stove plate	12.25 to 12.75
Grate bars	12.50 to 13.00
Brake shoes	11.50 to 12.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Consumption of babbitt metal in November, 1928, based on reports received by the Department of Commerce from 31 firms, was 5,659,937 lb. as compared with 5,796,419 lb. in October. For the 11 months ended November, 1928, the total was 54,720,343 lb, against 55,646,056 lb. for the corresponding period of 1927.

Cincinnati

New Pig Iron Competition From West Virginia

CINCINNATI, Dec. 31.—Interest in the pig iron market has centered in the blowing in of the furnace of the Wheeling Steel Corporation at Martin's Ferry, W. Va., which will run on foundry and malleable iron. A substantial portion of the output will be shipped by barge down the Ohio River to Cincinnati, Louisville and other points. This furnace is reported to have booked initial orders locally at a delivered price of approximately $21.25. The iron is to be transferred from barges to railroad cars at the Cincinnati river-rail terminal and will be delivered to various points within the Cincinnati switching district. Sales in the past week have been light and inquiries are scarce. The only sizable transactions consisted of 450 tons of Northern foundry iron for an Indiana melter and 600 tons of low phosphorus iron for a Michigan company. The price situation is firm and unchanged.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$20.39 to $20.89
Ala. fdy., sil. 1.75 to 2.25	20.19 to 20.69
Ala. fdy., sil. 2.25 to 2.75	20.69 to 21.19
Tenn. fdy., sil. 1.75 to 2.25	20.19
S'th'n Ohio silvery, 8 per cent	27.89 to 28.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Finished Material.—The Christmas holiday and the year-end inventory period had the effect of cutting down orders and specifications for sheet steel in the past week. However, the lessened demand is regarded as temporary, and a revival of buying on a substantial scale is expected early in January. Meanwhile, backlogs of district sheet mills are large enough to sustain operations at practically 100 per cent of capacity. There has been no deviation from the new schedule of prices, which is becoming more firmly established.

Coke.—Domestic grades for delivery to points outside the southern Ohio district have been increased 50c. a ton, with walnut size now selling at $4.50, ovens, and No. 2 nut at $4.

Old Material.—There is an underlying tone of strength to the scrap market, largely on account of speculation among dealers who expect an increased demand from users during the next 30 days. However, prices in the past week have not changed.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$13.75 to $14.25
Scrap rails for melting	13.50 to 14.00
Loose sheet clippings	9.75 to 10.25
Bundled sheets	10.50 to 11.00
Cast iron borings	9.75 to 10.25
Machine shop turnings	9.00 to 9.50
No. 1 busheling	11.00 to 11.50
No. 2 busheling	7.00 to 7.50
Rails for rolling	14.00 to 14.50
No. 1 locomotive tires	14.00 to 14.50
No. 2 railroad wrought	13.75 to 14.25
Short rails	19.00 to 19.50
Cast iron carwheels	12.50 to 13.00
No. 1 machine cast	18.50 to 19.00
No. 1 railroad cast	15.00 to 15.50
Burnt cast	10.00 to 10.50
Stove plate	10.00 to 10.50
Brake shoes	10.25 to 10.75
Railroad malleable	14.75 to 15.25
Agricultural malleable	13.75 to 14.25

New York

Elevated Highway Will Take 100,000 Tons of Steel—Order for 100 Locomotives

NEW YORK, Dec. 31.—Pig iron sales during the week were light, totaling 5000 to 6000 tons, and little new inquiry has appeared. Furnaces, however, received very few requests to hold up shipments until January, and the carryover of fourth quarter tonnage will be the smallest in years. The American Radiator Co. furnace at North Tonawanda, N .Y., has been blown in and two other Buffalo district stacks are scheduled to go in shortly. Their production, however, is said to be committed for some time ahead, so that no adverse effect on the market is looked for. The price situation is unchanged, with Buffalo foundry iron bringing $17.50 to $18, base furnace, and eastern Pennsylvania foundry, $19.50, base furnace.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$22.41 to $22.91
*Buf. No. 2, del'd east. N. J.	20.78 to 21.28
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	20.89 to 22.52
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	21.39 to 23.02
East. Pa. No. 1X fdy., sil. 2.75 to 3.25	21.89 to 23.52

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.
*Price delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Finished Steel.—Prospects for large lettings of structural steel in the first quarter appears as one of th outstanding features at the beginning of the new year. Bids will be taken shortly on the first section of the West Street elevated highway to be built by the City of New York. The entire project will require about 100,000 tons, and the requirements for the first section, extending from Canal Street to Twenty-second Street, will be about 25,000 tons. Bids have been opened on two subway sections calling for 34,000 tons of fabricated steel, but the award of the general contract has not been announced. December specifications and orders for various finished steel products were fairly good, and the month as a whole was much better in respect to tonnage than past Decembers have ordinarily been. Prices are stable. A good many contracts for plates and shapes on the basis of 2c., Eastern mill basing points, have been entered. Contracting for sheets and strips has been in about the usual volume. The New York Central has ordered 100 locomotives from the American Locomotive Co.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.24c. to 2.34c.; plates, 2.17½c. to 2.27½c.; struc. shapes, 2.14½c. to 2.24½c.; bar iron, 2.14c. to 2.24c.

Warehouse Business. — Continued mild weather has brought a steady demand for small lots of structural material from stock, which has continued through the last week of the year. Otherwise demand is light, but prices, even on black and galvanized sheets, are maintained with little shading. In conformity with the change by mills of the size extras on hoops and bands, warehouses will adopt the new schedule Jan. 1.

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.30c.
Soft steel bars, small shapes	3.25c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.50c.
Flats and squares	4.00c.
Cold-roll. strip, soft and quarter hard	5.15c. to 5.40c.
Hoops	4.50c.
Bands	4.00c.
Blue ann'l'd sheets (No. 10)	3.85c. to 3.90c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, 1½ x ½ in. and larger	3.30c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.65c.
Open-hearth spring steel, bases	4.50c. to 7.00c.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller	60
1 x 30 in. and smaller	50 to 50 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	60
¾ x 20 in. and smaller	50 to 50 and 10
Coach screws:	
½ x 6 in. and smaller	60
1 x 16 in. and smaller	50 to 50 and 10

	Per 100 Ft.
Boiler Tubes—	
Lap welded, 2-in	$17.33
Seamless steel, 2-in	20.24
Charcoal iron, 2-in	25.00
Charcoal iron, 4-in	67.00

Discounts on Welded Pipe

Standard Steel—	Black	Galv.
½-in. butt	46	29
¾-in. butt	51	37
1-3-in. butt	53	39
2½-6-in. lap	48	35
7 and 8-in. lap	44	17
11 and 12-in. lap	37	12
Wrought Iron—		
½-in. butt	5	+19
¾-in. butt	11	+ 9
1-1½-in. butt	14	+ 6
2-in. lap	5	+14
3-6-in. lap	11	+ 6
7-12-in. lap	3	+16

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box	$6.45	$6.20
Charcoal, per Box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

Terne Plate (14 x 20 in.)

IC—20-lb. coating	$10.00 to $11.00
IC—30-lb. coating	12.00 to 13.00
IC—40-lb. coating	13.75 to 14.25

Sheets, Box Annealed—Black, C. R. One Pass

	Per Lb.
Nos. 18 to 20	3.80c.
No. 22	3.95c.
No. 24	4.00c.
No. 26	4.10c.
No. 28*	4.25c.
No. 30	4.50c.

Sheets, Galvanized

	Per Lb.
No. 14	4.40c.
No. 16	4.25c.
No. 18	4.40c.
No. 20	4.50c.
No. 22	4.60c.
No. 24	4.75c.
No. 26	5.00c.
No. 28*	5.25c.
No. 30	5.65c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

Cast Iron Pipe.—No fresh inquiry for gas or water pipe has developed in the past week, but some fair tonnages of gas pipe are still pending, and a number of private companies have not yet entered the market for their usual spring requirements. The Interstate Equipment Corporation, Newark, N. J., which usually buys several thousand tons of gas pipe for spring delivery, has closed for about 400 tons. The Long Island Lighting Co., through E. L. Phillips & Co., 50 Church Street, New York, is reported to have closed on about 800 tons of gas pipe. The Rochester Gas & Electric Co., Rochester, N. Y., is about to place 1000 tons of gas pipe. Prices continue firm, with Southern foundries quoting $36 to $38 per ton, Birmingham, and Northern makers $39.60 to $40.60 per net ton, delivered New York.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $39.60 to $41.60; 4-in. and 5-in., $44.60 to $46.60; 3-in., $54.60 to $56.60; Class A and gas pipe, $4 to $5 extra.

Old Material.—All grades of scrap continue firm, but most of the present activity is in heavy melting steel and breakable cast. No. 1 heavy melting steel is quoted at $15.50 to $16 per ton, delivered eastern Pennsylvania mills, and one broker in New York is offering $18 per ton, delivered to consumers in the Pittsburgh district, which, with a $5.30 freight rate from New York, nets the seller here $12.70 per ton. Yard grade is being shipped to eastern Pennsylvania consumers, brokers offering $12 to $12.25 per ton, Pottsville; $12.50 per ton, Phoenixville, and $13.25 per ton, Conshohocken, Pa. For shipment to western Pennsylvania, $16 per ton is quoted, which, with a $5.30 freight rate from New York, nets the seller $10.70 per ton. However, on these shipments reduction by the mill of $1 to $1.50 per ton have not been uncommon lately. Heavy breakable cast is being shipped to Claymont, Del., and Harrisburg, Pa., at $15.50 per ton, delivered. Other grades are inactive, but the price situation is strong.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	$12.00 to	$12.70
Heavy melting steel (yard)	8.75 to	9.75
No. 1 hvy. breakable cast.	11.75 to	12.00
Stove plate (steel works)		8.50
Locomotive grate bars		8.50
Machine shop turnings	7.25 to	7.50
Short shoveling turnings	7.25 to	7.50
Cast borings (blast furn. or steel works)	6.75 to	7.00
Mixed borings and turnings	6.75 to	7.00
Steel car axles	17.00 to	17.50
Iron car axles	24.00 to	24.50
Iron and steel pipe (1 in. dia., not under 2 ft. long)		10.75
Forge fire	8.00 to	8.50
No. 1 railroad wrought	12.25 to	12.75
No. 1 yard wrought, long	11.25 to	11.75
Rails for rolling	13.00 to	13.50
Cast iron carwheels	12.00 to	12.50
Stove plate (foundry)		9.50
Malleable cast (railroad)	10.00 to	10.50
Cast borings (chemical)		11.25

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	$17.00
No. 1 hvy. cast (columns, bldg. materials, etc.), cupola size	15.00
No. 2 cast (radiators, cast boilers, etc.)	14.50

Philadelphia

Last Week of Year More Active Than Usual—Scrap Market Maintains Upward Trend

PHILADELPHIA, Dec. 31.—While business showed some recession in the past week, specifications and new contracts received by steel mills were in considerably greater volume than is usual in the closing week of the year. Pig iron has been rather inactive except for continued shipments on contracts, but prices are apparently slightly firmer at $21 per ton, furnace, for foundry iron. The iron and steel scrap market is maintaining the strong upward trend that began to develop about 10 days ago, and dealers are paying higher prices to secure sufficient material to ship on their contracts.

Pig Iron.—Foundry grade is firmer at the first quarter quotation of $21 per ton, following a fair volume of tonnage placed recently for shipment into the first quarter at $20.50 per ton. Consumers are evidently using all the iron being shipped to them on contracts and have been less inclined than is usual at this season to request delays in deliveries until after the inventory period. Some sample orders of British low phosphorus iron, totaling about 100 tons each, are understood to have been placed by John A. Roebling's Sons Co. An inquiry for 4000 tons of basic iron is in the market from a Phoenixville, Pa., consumer, but other large users of basic in this district are reported to have covered their basic requirements well into the first quarter.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$21.26 to $21.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	21.76 to 22.26
East. Pa. No. 1X	22.26 to 22.76
Basic (del'd east. Pa.)	19.75 to 20.25
Gray forge	20.50 to 21.00
Malleable	21.25 to 21.75
Stand. low phos. (f.o.b. N. Y. State furnace)	22.00 to 23.00
Cop. b'r'g low phos. (f.o.b. furnace)	23.00 to 23.50
Va. No. 2 plain, 1.75 to 2.25 sil.	25.29
Va. No. 2X, 2.25 to 2.75 sil.	25.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces: $4.54 from Virginia furnaces.

Bars, Shapes and Plates.—Bar mills are well filled with tonnage for delivery in the first quarter and are maintaining prices firmly at 1.90c. to 2c., Pittsburgh, or 2.22c. to 2.42c., Philadelphia. Some desirable reinforcing bar business is in prospect in this district, including about 800 tons not yet inquired for, which will be required in a plant to be erected on the Schuylkill River by the Gulf Refining Co. Plate mills still have a considerable tonnage in prospect for shipbuilding contracts not yet awarded to the shipyards. Plate contracts for first quarter have been at 2c. to 2.05c. per lb., Coatesville, or 2.10c. to 2.15c., Philadelphia. Shapes continue unchanged at 2c. to 2.05c., f.o.b. nearest mill to consumer, or, on a basis of Pencoyd, Pa., 2.06c. to 2.11c., delivered Philadelphia. On desirable tonnages less than 2c., mill, is occasionally obtainable.

Sheets.—Fair-sized contracts for blue annealed sheets have been closed at 2c. to 2.10c., Pittsburgh, or 2.32c. to 2.42c., Philadelphia, the price depending upon the width. Black and galvanized sheet contracting has not yet been sizable, but, as consumers are apparently using a good tonnage and expect to maintain their present rate of operation in the new year, further commitments are expected by sellers. Prices are firm at 2.85c., Pittsburgh, on black, and 3.60c., Pittsburgh, on galvanized sheets.

Imports.—In the week ended Dec. 29 ore imports consisted of 7580 tons of Algerian iron ore and one ton of manganese ore from Germany; 2000 tons of pig iron arrived, also 30 tons of British ferromanganese and 25 tons of ferrochrome from Switzerland; 87 tons of structural shapes came from Belgium, 35 tons from France and 10 tons of strip steel from the United Kingdom.

Old Material.—Reflecting a strong price situation in the Pittsburgh district, eastern Pennsylvania scrap prices show a continued upward tendency. No. 2 heavy melting steel is quoted at $12.50 to $13 per ton, delivered, and No. 1 heavy melting steel is firm at the present basis of $16 to $16.50 per ton. Holders of scrap are not inclined to sell freely in the present rising market, and brokers filling contracts are in a large number of cases paying in excess of the price they are receiving from consumers.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$16.00 to $16.50
Scrap T rails	15.50 to 16.00
No. 2 heavy melting steel	12.50 to 13.00
No. 1 railroad wrought	16.00 to 16.50
Bundled sheets (for steel works)	11.00 to 11.50
Machine shop turnings (for steel works)	11.00 to 11.50
Heavy axle turnings (or equiv.)	12.50 to 13.00
Cast borings (for steel works and roll. mill)	11.00 to 11.50
Heavy breakable cast (for steel works)	15.50 to 16.00
Railroad grate bars	12.50
Stove plate (for steel works)	12.50
No. 1 low phos., hvy., 0.04% and under	19.00 to 20.00
Couplers and knuckles	17.50 to 18.00
Rolled steel wheels	17.00 to 17.50
No. 1 blast f'nace scrap	10.00 to 11.00
Wrot. iron and soft steel pipes and tubes (new specific.)	15.00
Shafting	18.50 to 19.00
Steel axles	21.50 to 22.00
No. 1 forge fire	12.00 to 12.50
Cast iron carwheels	16.50
No. 1 cast	16.25 to 16.75
Cast borings (for chem. plant)	15.00
Steel rails for rolling	16.50 to 17.00

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.70c.
Plates, ⅛-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands)	2.80c.
Round-edge iron	3.50c.
Round-edge steel, iron finished 1½ x 1½ in.	3.50c.
Round-edge steel, planished	4.30c.
Reinforc. steel bars, sq. twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex	3.45c.
Cold-fin. steel, sq. and flats	3.95c.
Steel hoops	3.60c.
Steel bands, No. 12 to ⅛-in., inclus.	3.35c.
Spring steel	5.00c.
*Black sheets (No. 24)	4.00c.
†Galvanized sheets (No. 24)	4.75c.
Blue ann'l'd sheets (No. 10)	3.15c.
Diam. pat. floor plates—	
¼-in.	5.30c.
⅛-in.	5.50c.
Rails	3.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

Cleveland

After-Inventory Steel Shipments Expected to Be Heavy—Automotive Industry Swinging Into Larger Production

CLEVELAND, Dec. 31.—Business held up well in the volume of specifications for steel bars, structural material and plates during the week, but not much new business came out during the holiday period. Most consumers have specified about all the material due on their last quarter contracts, but so far there has been little material released against first quarter contracts.

Mill shipments are expected to be heavy during the next few days, as considerable tonnage recently released is ordered for shipment after Jan. 1. Consumers, as a rule, reduced stocks considerably for inventories, and after inventories are over, in the next few days, they are expected to issue liberal releases for replenishment.

The automotive industry has taken care of much of its steel requirements for January. Several of the motor car companies reduced operations during the holiday season, but are expected to get back on good production schedules on new models early this month. With the Chevrolet Motor Car Co. gradually increasing production on its new cars and with the Ford company now on a large production schedule, the January production of motor cars will probably be fairly heavy. Forge shops in this territory doing automotive work are scheduled for capacity operation this month, and stamping plants will be busier than a few weeks ago.

Structural lettings during the week included three jobs aggregating over 4700 tons. Railroads in this territory have not yet sent out inquiries covering their 1929 rail requirements.

Prices are firm at 1.90c. to 1.95c., Cleveland and Pittsburgh, for steel bars and at 1.90c. to 1.95c., Pitts-

burgh, for plates and structural material.

Pig Iron.—Sales have held up well for the holiday season. December shipments did not fall below those of November. While there were a few hold-ups because of inventories, some of the furnaces shipped as much iron during the month as they made. Cleveland interests sold 18,000 tons of foundry and malleable iron the past week, practically all in sections outside of the immediate Cleveland territory. Melters have started to issue liberal specifications for January shipments, and indications point to a heavy melt this month. Some of the automobile foundries will take more iron during January than in December. Good specifications are coming from the stove and furnace manufacturers, and the radiator industry is planning larger production schedules. Not much new buying is looked for during January, as most foundries have placed contracts. The market is firm at recent prices of $18.50, Cleveland, for foundry and malleable iron for outside shipment. Other Lake furnaces remain on a minimum of $19.50 basis, with $20 the prevailing price for Michigan.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$19.50
S'th'n fdy. 1.75 to 2.25	$22.50 to 23.00
Malleable	19.50
Ohio silvery, 8 per cent	29.00
Basic Valley furnace	17.50
Stand. low phos., Valley	26.50 to 27.00

Prices, except on basic and low phosphorus, are delivered Cleveland. Freight rates: 50c. from local furnaces; $3 from Jackson, Ohio; $6 from Birmingham.

Sheets.—Mills are starting the new year with good order books, which will keep some of them at full operation for six weeks on auto body sheets and about three weeks on other grades. Indications are for heavy consumption by the automotive industry through the first quarter. Quite a little of the tonnage entered for January shipment was at the new prices, which are firmly maintained.

Strip Steel.—New business in specifications for hot-rolled strip steel are light, but mills have fairly heavy tonnage on their books for January shipment against old contracts. Considerable business in cold-rolled strip has been taken in first quarter contracts, and some of the mills have enough specifications for cold-rolled strip to carry them well through January.

Wire Products.—Mills continued to accept specifications against old contracts until the end of the month and the $2 a ton price advance resulted in heavy specifications. Consequently, jobbers will be well stocked at the old prices and there will not be much test of the new prices for a few weeks.

Warehouse Business. — Local jobbers, as of Jan. 1, have adopted for hoops and bands the new mill card of extras on flat-rolled steel. The old warehouse base of 3.65c. remains in effect, thus maintaining the former differential in the warehouse base between hoops and bands and steel bars. The new extras will mean a price advance of about $3 a ton on sizes that are most frequently called for from jobbers' stocks.

Bolts and Nuts.—There has been a good volume of contracting for the first quarter at the re-established prices. December shipments fell off considerably, which was partly due to the shutting down of makers' plants for inventories.

Coke.—Specifications for foundry coke are light and there is little new business. Prices on Connellsville foundry grades are unchanged. Ohio by-product coke is quoted at $7.75, Painesville.

Fluorspar.—The gravel fluorspar market has been definitely established for the year at $18, mines, on sales of several round lots aggregating 15,000 to 20,000 tons. Producers have marked up No. 2 lump fluorspar $2 a ton to $20, thus restoring the usual $2 differential between this grade and the gravel material.

Old Material.—The market is very firm, but is feeling the effect of the holiday lull. There is some buying by dealers to cover outstanding orders. Dealers are paying as high as $17 for high grade heavy melting steel for delivery to a Cleveland mill, about 25c. a ton higher than a week ago. Blast furnace scrap is firmer, dealers finding little, if any, available below $11.75. Low phosphorus scrap has advanced. Good-sized January lists are being issued by the Michigan automobile companies. Lists include: Chevrolet, 4500 tons; Buick, 3500 tons.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades	
No. 1 heavy melting steel	$14.75 to $15.25
No. 2 heavy melting steel	14.25 to 14.75
Compressed sheet steel	14.50 to 15.00
Light bundled sheet stamp'gs	12.00 to 12.50
Drop forge flashings	12.25 to 12.75
Machine shop turnings	10.25 to 10.75
No. 1 railroad wrought	12.75 to 13.00
No. 2 railroad wrought	14.50 to 15.00
No. 1 busheling	12.50 to 12.75
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades	
Low phos. forging crops	18.50 to 19.00
Low phos., billet, bloom and slab crops	18.50 to 19.00
Low phos. sheet bar crops	17.50 to 18.00
Low phos. plate scrap	16.50 to 17.00
Blast Furnace Grades	
Cast iron borings	11.50 to 12.00
Mixed bor'g and short turn'gs	11.50 to 12.00
No. 2 busheling	11.50 to 12.00
Cupola Grades	
No. 1 cast	16.50 to 17.00
Railroad grate bars	11.00 to 12.00
Stove plate	12.00 to 12.50
Rails under 3 ft	16.75 to 17.25
Miscellaneous	
Railroad malleable	16.00 to 16.50
Rails for rolling	16.25 to 16.50

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struct. shapes	3.00c.
Soft steel bars	3.00c.
Reinforc. steel bars	2.25c. to 2.50c.
Cold-fin. rounds and hex	3.65c.
Cold-fin. flats and sq	4.15c.
Hoops and bands	3.65c.
Cold-finished strip	*5.95c.
Black sheets (No. 24)	3.50c.
Galvanized sheets (No. 24)	4.45c.
Blue ann'l'd sheets (No. 10)	3.25c.
No. 9 ann'l'd wire, per 100 lb	$2.95
No. 9 gal. wire, per 100 lb	3.40
Com. wire nails, base per keg	2.95

*Net base, including boxing and cutting to length.

Germany Looks to Export Markets for 1929

(By Radiogram)

BERLIN, GERMANY, Dec. 31.

DUESSELDORF experts predict for 1929 a further moderate weakening in the domestic steel market, and a corresponding decline in production, which Germany will attempt to counterbalance by forcing steel into export channels. It is expected that Germany will demand from the International Steel Cartel an increase of her export quota of 300,000 tons monthly.

Advance in pig iron prices is being considered, as a result of the arbitration decision increasing wages in the Rhenish-Westphalian district, but so far the syndicates are selling for January delivery at December prices.

Domestic markets are quiet, except for semi-finished products, of which the stocks were nearly exhausted during the November lockout. Export trade is satisfactory to Scandinavia, South America and the Far East, but otherwise it is dull.

Youngstown

Mills Busy and Look for Record First Quarter

YOUNGSTOWN, Dec. 31.—The steel industry of northeastern Ohio enters the new year with sheet and strip mills operating close to capacity, and the outlook is for a record production in the first quarter, owing to heavy demands from the automotive industry.

The Youngstown Sheet & Tube Co. has started D blast furnace in its Campbell group to replace Jeanette stack at the Brier Hill plant, withdrawn from blast for relining. D furnace has been relined. Following a week's idleness, the Ohio properties at Girard and Warren of the A. M. Byers Co., Pittsburgh, have resumed production. The eight-mill sheet plant at Niles of the Falcon Steel Co., now a part of the Empire Steel Corporation, Mansfield, resumes this week, having been idle several months. There are no suspensions this week in the Mahoning Valley for New Year's Day observance, and production is sustained at fully 82 per cent.

With the starting of the Sheet & Tube stack, this company is now operating six of eight blast furnaces at Youngstown, and five of seven in the Chicago district. Its resumption gives the district 26 active blast furnaces, out of 37, producing 75 per cent of the district's rated capacity.

The sheet mill schedule is one of the heaviest in many months and shows the following active mills: Republic Iron & Steel, 41; Youngstown Sheet & Tube, 28; Newton Steel, 20; Thomas Sheet Steel, 10; Sharon Steel Hoop, 9; Falcon Steel, 8; Waddell Steel, 7.

Of 53 open-hearth furnaces, 43 are active, a gain of two, compared with the preceding week.

Birmingham

Steel Demand More Active Than Usual at This Time of Year —Pig Iron Quiet

BIRMINGHAM, Dec. 31.—The pig iron market has been inactive during the holiday period. Shipments have been held up owing to suspended foundry operations and to a general desire on the part of consumers to carry as little iron into the next year as possible. Neither furnaces nor mills have large stocks. The important consumers are covered for the first quarter. One maker continues to quote $17 and the others $16.50. The Sloss-Sheffield Steel & Iron Co. plans to blow in its rebuilt City furnace some time in January. All furnaces of the Tennessee company were changed to foundry iron for two days, Dec. 24 and 25, then changed back to basic. Of the 19 furnaces in blast, eight are on foundry, nine on basic, one on recarburizing iron and one on ferromanganese.

Prices per gross ton, f. o. b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$16.50 to $17.00
No. 1 fdy., 2.25 to 2.75 sil.	17.00 to 17.50
Basic	16.50

Finished Steel.—New business and specifications on contracts during the past week exceeded those of the previous week and were about equal to the weekly average for December. This is the first time in several years that the more important lines of finished steel have been active at this season. Good business is reported in prospect for the first quarter. Prices are firm and unchanged. Structural steel fabricators and reinforcing bar manufacturers will begin the year with better schedules and more business in prospect than for some time. The Tennessee company has been operating seven or eight open-hearths at Ensley and six or seven at Fairfield. The Gulf States Steel Co. has four on at Alabama City.

Cast Iron Pipe.—Pressure and soil pipe plants have been closed down during the past few days and needed repairs have been made. Operations are to be resumed this week. Plants in the district are bidding on a project for Milwaukee requiring about 9000 tons and another for Detroit requiring 5700 tons of 24 to 48-in. pipe. The soil pipe market has a better outlook than at any time in the past several months. Quotations remain at $37 to $38 on 6-in. and larger sizes.

Old Material.—Conditions are quiet with prices unchanged. Dealers have sufficient stocks to meet demands and are waiting for the resumption of buying that is expected to follow the turn of the year.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:

Heavy melting steel		$12.50
Scrap steel rails	$12.00 to	12.50
Short shoveling turnings	8.00 to	8.50
Cast iron borings		8.00
Stove plate		13.50
Steel axles	19.00 to	20.00
Iron axles	21.00 to	22.00
No. 1 railroad wrought	10.00 to	10.50
Rails for rolling	14.00 to	15.00
No. 1 cast		15.00
Tramcar wheels	13.00 to	14.00
Cast iron carwheels	13.00 to	13.50
Cast iron borings, chem	13.50 to	14.00

St. Louis

December Steel Orders of Granite City Mill 60 Per Cent Ahead of Same Month in 1927

ST. LOUIS, Dec. 31.—The pig iron market was extremely quiet during the holiday week. Sales of the St. Louis Gas & Coke Corporation amounted only to 1450 tons, all made on the last day of the week. One lot of 750 tons of foundry iron was sold to an Iowa specialty maker, and 200 tons of the same grade will go to an Illinois stove plant, all for first quarter shipment, and 500 tons of wheel iron for immediate shipment was sold to a district car builder. Prices are firm.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$20.00
Malleable, f.o.b. Granite City	20.50
N'th'n No. 2 fdy., deliv'd St. Louis	22.16
Southern No. 2 fdy., deliv'd	20.92
Northern malleable, deliv'd	22.16
Northern basic, deliv'd	22.16

Freight rates: 81c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Finished Iron and Steel.—December orders received by the Granite City Steel Co. up to the 28th were about 60 per cent ahead of the same period in 1927, and for the year up to Dec. 28 total tonnage was about 30 per cent ahead of that of the preceding year. Plates, which have been quite dull, are beginning to show life. The company's sheet mills, which were closed down last week for repairs after having been run to full capacity for some time, will resume this week. Tin plate business has not been very good, and five of the 20 mills recently operated are down for repairs and lack of orders. Warehouse business is still affected adversely by the holidays.

Old Material.—A few sales of malleable and rolling mill grades were made, but there was almost nothing doing in steel scrap during the past week. The market continues firm in the expectation that consumers will make heavy purchases shortly. No. 1 busheling, cast iron borings and shoveling turnings are 25c. a ton higher; iron rails, No. 1 railroad wrought, No. 1 machinery cast, railroad malleable, No. 1 railroad cast and agricultural malleable are 50c. higher. Railroad lists: Union Pacific, 1630 tons; Big Four lines, 1150 tons; Missouri-Kansas-Texas, 490 tons; Missouri Pacific, 150 carloads; Chicago, Milwaukee, St. Paul & Pacific, 83 carloads; Mobile & Ohio, 11 carloads.

Dealers' buying prices, per gross ton, f.o.b. St. Louis district:

No. 1 heavy melting or shoveling steel	$13.25 to $13.75
No. 2 heavy melting or shoveling steel	12.50 to 13.00
No. 1 locomotive tires	14.50 to 15.00
Miscel. stand.-sec. rails including frogs, switches and guards, cut apart	15.00 to 15.50
Railroad springs	16.25 to 16.75
Bundled sheets	9.50 to 10.00
No. 2 railroad wrought	13.25 to 13.75
No. 1 busheling	9.75 to 10.00
Cast iron borings and shoveling turnings	9.00 to 9.50
Iron rails	14.00 to 14.50
Rails for rolling	15.50 to 16.00
Machine shop turnings	8.00 to 8.50
Heavy turnings	9.50 to 10.00
Steel car axles	19.50 to 20.00
Iron car axles	27.00 to 27.50
Wrot. iron bars and trans.	22.00 to 22.50
No. 1 railroad wrought	13.50 to 14.00
Steel rails, less than 3 ft.	17.50 to 18.00
Steel angle bars	14.25 to 14.75
Cast iron carwheels	14.50 to 15.00
No. 1 machinery cast	16.00 to 16.50
Railroad malleable	15.50 to 16.00
No. 1 railroad cast	14.50 to 15.00
Stove plate	12.50 to 13.00
Agricult. malleable	12.00 to 12.50
Relay. rails, 60 lb. and under	20.50 to 23.50
Relay. rails, 70 lb. and over	26.50 to 29.00

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.75c.
Black sheets (No. 24)	4.10c.
Galv. sheets (No. 24)	4.95c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.15c
Galv. corrug. sheets	5.00c.
Structural rivets	3.75c.
Boiler rivets	3.75c.
	Per Cent Off List
Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-press. nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb	50

Buffalo

Bethlehem Plant Increases Operations; Scrap Strong

BUFFALO, Dec. 31.—Holiday quiet is prevalent in the pig iron market. New England furnished an inquiry for 1000 tons of foundry, and a New Jersey melter requires 300 tons. Other inquiries and sales were confined to small lots. The Tonawanda Iron Corporation stack was blown in last week, having been out several weeks for re-

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.75c.
Cold-finn. flats, sq. and hex.	4.45c.
Rounds	3.95c.
Cold rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$3.60
Black wire, base per 100 lb.	3.75

pairs. Two other stacks will be added to the district's total within a couple of weeks. Furnaces have succeeded in reducing their stocks to a minimum, and all enter the first quarter of the year with sizable order books. One local interest announces that it is almost entirely sold up for first quarter.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$18.00 to $18.50
No. 2X fdy., sil. 2.25 to 2.75	18.50 to 19.00
No. 1X fdy., sil. 2.75 to 3.25	19.50 to 20.00
Malleable sil. up to 2.25	18.50 to 19.00
Basic	17.50 to 18.00
Lake Superior charcoal	27.28

Finished Iron and Steel.—Business has been fair over the holiday period. Operations at the Bethlehem Steel Co.'s Lackawanna plant, which had been reduced to 15 open-hearth furnaces, were increased to 18 last week. The Donner Steel Co. has eight open-hearths active; other plants are running at about 80 per cent of capacity.

Old Material.—The market here for No. 1 heavy melting steel was definitely established at $17 the past week, when one of the local users bought a considerable lot at this price. The same interest also bought a tonnage of No. 1 busheling paying $16. These were the only transactions of note, but the strength of the local market and with the demand from other districts lend color to the prediction of some dealers that $18 heavy melting steel will be a fact within a few weeks. Considerable tonnage of hydraulic compressed sheets and No. 2 busheling from the Rochester and Syracuse districts is being shipped to Pittsburgh. A few sales of cast iron borings at $11.50 have been made; there seems to be a scarcity of this grade. Railroad knuckles and couplers and rolled steel wheels have been sold during the week at $17.50. The largest user of scrap in the district shows no disposition to come into the market and estimates that it will not buy within 60 days, having about 90 days' supply on hand.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades	
No. 1 heavy melting steel	$16.50 to $17.00
No. 2 heavy melting steel	13.25 to 14.00
Scrap rails	15.50 to 16.00
Hydraul. comp. sheets	13.50 to 14.00
Hand bundled sheets	12.00 to 12.50
Drop forge flashings	13.00 to 13.75
No. 1 busheling	15.00 to 16.00
Hvy. steel axle turnings	13.50 to 14.00
Machine shop turnings	7.50 to 8.00
No. 1 railroad wrought	12.50 to 13.00
Acid Open-Hearth Grades	
Knuckles and couplers	17.50 to 18.50
Coil and leaf springs	17.50 to 18.00
Rolled steel wheels	17.00 to 17.50
Low phos. billet and bloom ends	18.00 to 18.50
Electric Furnace Grades	
Short shov. steel turnings	11.00 to 11.50
Blast Furnace Grades	
Short mixed borings and turnings	11.00 to 11.50
Cast iron borings	11.00 to 12.00
No. 2 busheling	9.00 to 9.50
Rolling Mill Grades	
Steel car axles	18.75 to 19.25
Iron axles	21.00 to 22.00
Cupola Grades	
No. 1 machinery cast	15.50 to 16.00
Stove plate	14.50 to 14.75
Locomotive grate bars	13.00 to 13.50
Steel rails, 3 ft. and under	17.50 to 18.00
Cast iron carwheels	13.00 to 13.50
Malleable Grades	
Industrial	16.00 to 16.50
Railroad	16.00 to 16.50
Agricultural	16.00 to 16.50

Boston

Pig Iron and Cast Iron Pipe Prices Easier—Scrap Market Remains Strong

BOSTON, Dec. 31.—The purchase by the General Electric Co. of 600 tons of pig iron for Everett, Mass., 800 tons for Pittsfield, Mass., and 700 tons for West Lynn, Mass., first quarter delivery, and an inquiry for 1000 tons of No. 1X first quarter iron from a Massachusetts textile machinery maker featured an otherwise dull and uninteresting market the past week. It is reported the Mystic Iron Works took practically all of the General Electric Co. business. It is also reported that the 1000-ton lot will be bought at the equivalent of $19 a ton on cars, Buffalo, or slightly less. No sales of Buffalo No. 1X at $19.50 a ton, furnace, have been reported for a fortnight or so, but $19 or its equivalent has been done on small tonnages, while unimportant lots of No. 2X iron have sold at the equivalent of $18, Buffalo furnace.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25	$22.41	to $22.91
*Buffalo, sil. 2.25 to 2.75	22.91	to 23.41
East. Penn., sil. 1.75 to 2.25	24.15	to 24.65
East. Penn., sil. 2.25 to 2.75	24.65	to 25.15
Va., sil. 1.75 to 2.25		26.91
Va., sil. 2.25 to 2.75		27.41
Ala., sil. 1.75 to 2.25	23.41	to 25.77
Ala., sil. 2.25 to 2.75	23.91	to 26.27

Freight rates: $4.91 all rail from Buffalo; $3.65 from eastern Pennsylvania; $5.21 all rail from Virginia; $6.91 to $8.77 from Alabama.

*All rail rate.

Cast Iron Pipe.—French and Southern pipe makers failed to bid on the 1000 tons of 8-in. Class B pipe, 150 tons of 10-in., 500 tons of 12-in., and 350 tons of 16-in., a total of 2000 tons required by Boston. The Warren Foundry & Pipe Co. was the low bidder, the United States Cast Iron Pipe & Foundry Co. second, and R. D. Wood & Co. the third low bidder. The 30 tons of special castings, 24 to 48-in. stock, also will probably go to the Warren Foundry & Pipe Co. Lexington, Mass., is said to have closed on 450 tons of 12-in., but the seller's name is withheld. One New England public utility company is still negotiating for 4000 tons of pipe; another has just come into the market for 3000 tons, and a third will be in the market around Jan. 15 for approximately 4000 tons. Private business was small the past week. Limited tonnages of 4-in. pipe were sold at $47.10 to $48.10 a ton, delivered at common Boston freight rate points, and of 8 to 12-in. stock at $44.10 to $45.10 for quick delivery. Concessions are to be had on large tonnages of 8 to 10-in. The usual differential is asked on Class A and gas pipe.

Coke.—New England by-product foundry coke is unchanged at $11 a ton, delivered within a $3.10 freight rate zone, the prevailing price of the past nine months.

Importations.—Arrivals of foreign pig iron at this port the first half of December totaled 1686 tons, of which 949 tons was Indian and 737 tons Dutch.

Old Material.—Comparatively little material was moved out of New England the past week, and foundries in this section were disinclined to stock up on scrap pending the completion of inventories. Prices remained firm, however, and in a few instances averaged a shade higher in sympathy with the Pittsburgh district market.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$11.50 to $11.75
Scrap T rails	11.00 to 11.25
Scrap girder rails	10.00 to 10.25
No. 1 railroad wrought	11.50 to 12.00
No. 1 yard wrought	9.00 to 9.50
Machine shop turnings	6.25 to 6.50
Cast iron borings (steel works and rolling mill)	6.00 to 6.25
Bundled skeleton, long	9.00 to 9.25
Forge flashings	9.00 to 9.50
Blast furnace borings and turnings	5.75 to 6.10
Forge scrap	8.00 to 8.50
Shafting	13.00 to 13.50
Steel car axles	16.00 to 16.50
Wrought pipe 1 in. in diameter (over 2 ft. long)	9.50 to 10.00
Rails for rolling	11.5c to 12.00
Cast iron borings, chemical	10.00 to 10.50

Prices per gross ton deliv'd consumers' yards:

Textile cast	$14.00 to $14.50
No. 1 machinery cast	15.00 to 15.50
No. 2 machinery cast	13.00 to 13.50
Stove plate	11.00 to 11.50
Railroad malleable	15.50 to 15.75

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway, squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold rolled steel—	
Rounds and hex	*3.55c. to 5.55c.
Squares and flats	*4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.
	Per Cent Off List
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

Steel Freight Rate Hearing Jan. 3-4

WASHINGTON, Dec. 31.—The Interstate Commerce Commission has set Jan. 3 and 4 as the dates for arguments in the general steel rate structure case, covering rates on manufactured iron and steel products throughout official classification territory.

Non-Ferrous Metal Markets

Copper Very Active at Higher Prices, Tin Quiet But Firm, Lead and Zinc Inactive at Unchanged Quotations

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Dec. 31	Dec. 29	Dec. 28	Dec. 27	Dec. 26
Lake copper, New York	16.62½	16.62½	16.37½	16.37½	16.37½
Electrolytic copper, N. Y.*	16.25	16.25	16.25	16.25	16.00
Straits tin, spot, N. Y.	50.12½	....	50.50	50.25	49.87½
Lead, New York	6.50	6.50	6.50	6.50	6.50
Lead, St. Louis	6.35	6.35	6.35	6.35	6.35
Zinc, New York	6.70	6.70	6.70	6.70	6.70
Zinc, St. Louis	6.35	6.35	6.35	6.35	6.35

*Refinery quotation; delivered price ¼c. higher.

NEW YORK, Dec. 31.

Copper.—Heavy buying, particularly by foreign consumers, has been the feature of the closing week of the year and the result has been two sharp advances in prices. Electrolytic copper for domestic consumption was advanced to 16.25c., delivered in the Connecticut Valley, the middle of last week, and to 16.50c. at the close of the week. For foreign consumption, Copper Exporters, Inc., advanced its quotation to 16.50c. on Dec. 27 and again to 16.75c., c.i.f. European ports, today, Dec. 31. Foreign consumers are estimated to have purchased about 60,000 tons during the month and at the rate of 5000 tons a day in the last three or four days. Sales last Friday and Saturday were over 6000 tons on each day. Buying has been confined largely to January and February, with considerable metal yet to be purchased for February. Domestic consumers have been quite liberal buyers, principally for March, with some April metal contracted for, but not much. Lake copper is quite active and very firm and has been advanced in price twice within the last week, being quoted today at 16.50c. to 16.62½c., delivered. The year closes with the copper market in the strongest position since the war.

Copper Averages.—The average price of Lake copper for December, based on daily quotations in THE IRON AGE, was 16.19½c. The average price of electrolytic copper was 15.84c., refinery, or 16.09c., delivered in the Connecticut Valley.

Tin.—Because of the holidays, business in Straits tin has been very light and sales for the week ended Dec. 29 amounted to about 600 tons. Dealers were the best buyers, with consumers showing little interest. Prices have been firm and tending somewhat higher. Spot Straits tin today, in a market that was by no means active, was quoted at 50.12½c., New York. London prices today were a little higher than a week ago, with spot standard quoted at £225 15s., future standard at £225 10s. and spot Straits

Metals from New York Warehouse

Delivered Prices Per Lb.

Tin, Straits pig	51.75c. to 52.75c.
Tin, bar	53.75c. to 54.75c.
Copper, Lake	17.50c.
Copper, electrolytic	17.25c.
Copper, casting	17.00c.
Zinc, slab	7.50c. to 8.00c.
Lead, American pig	7.50c. to 8.00c.
Lead, bar	9.50c. to 10.00c.
Antimony, Asiatic	12.00c. to 13.00c.
Aluminum No. 1 ingots for remelting (guar'nt'd over 99% pure)	25.00c. to 26.00c.
Alum. ingots, No. 12 alloy	24.00c. to 25.00c.
Babbitt metal, commerc'l grade	30.00c. to 40.00c.
Solder, ½ and ½	33.00c. to 34.00c.

Metals from Cleveland Warehouse

Delivered Prices Per Lb.

Tin, Straits pig	54.50c.
Tin, bar	56.50c.
Copper, Lake	17.00c.
Copper, electrolytic	17.00c.
Copper, casting	16.75c.
Zinc, slab	8.00c.
Lead, American pig	7.00c. to 7.25c.
Lead, bar	9.75c.
Antimony, Asiatic	16.00c.
Babbitt metal, medium grade	19.25c.
Babbitt metal, high grade	58.50c.
Solder, ½ and ½	33.75c.

Rolled Metals from New York or Cleveland Warehouse

Delivered Prices, Base Per Lb.

Sheets—	
High brass	20.62½c.
Copper, hot rolled	25.37½c.
Copper, cold rolled, 14 oz. and heavier	26.62½c.
Seamless Tubes—	
Brass	25.50c.
Copper	26.37½c.
Brazed Brass Tubes	28.62½c.
Brass Rods	18.37½c.

From New York Warehouse

Delivered Prices, Base Per Lb.

Zinc sheets (No. 9), casks	10.00c. to 10.50c.
Zinc sheets, open	11.00c. to 11.50c.

Non-Ferrous Rolled Products

Mill prices on brass products and copper seamless tubes were advanced ¼c. on Dec. 26 and other copper products were advanced ⅜c. on the same date. Another ¼c. increase on all brass and copper products went into effect on Dec. 31. Zinc sheets and lead full sheets are unchanged.

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets—	
High brass	21.00c.
Copper, hot rolled	25.62½c.
Zinc	9.75c.
Lead (full sheets)	10.25c. to 10.50c.
Seamless Tubes—	
High brass	25.87½c.
Copper	26.87½c.
Rods—	
High brass	18.75c.
Naval brass	20.75c.
Wire—	
Copper	18.50c.
High brass	21.50c.
Copper in Rolls	24.62½c.
Brazed Brass Tubing	29.00c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

Sheets, 0 to 10 gage, 3 to 30 in. wide	33.00c.
Tubes, base	42.00c.
Machine rods	34.00c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged customers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	14.00c.	15.25c.
Copper, hvy. and wire	13.75c.	14.75c.
Copper, light and bottoms	12.00c.	13.00c.
Brass, heavy	7.75c.	9.00c.
Brass, light	6.50c.	7.50c.
Hvy. machine composition	10.75c.	11.75c.
No. 1 yel. brass turnings	9.50c.	10.00c.
No. 1 red brass or compos. turnings	10.25c.	11.00c.
Lead, heavy	5.125c.	5.625c.
Lead, tea	3.75c.	4.25c.
Zinc	3.25c.	3.75c.
Sheet aluminum	13.00c.	15.00c.
Cast aluminum	11.75c.	13.50c.

Rolled Metals, f.o.b. Chicago Warehouse

(Prices Cover Trucking to Customers' Doors in City Limits)

Sheets—	Base per Lb.
High brass	20.75c.
Copper, hot rolled	25.37½c.
Copper, cold rolled, 14 oz. and heavier	27.62½c.
Zinc	10.00c.
Lead, wide	10.55c.
Seamless Tubes—	
Brass	27.12½c.
Copper	28.12½c.
Brass Rods	18.50c.
Brazed Brass Tubes	28.75c.

at £225 17s. 6d. The Singapore price today was £230 17s. 6d.

Lead.—The past week has been fairly active, considering the time of year, with prices unchanged at 6.35c., St. Louis, for early delivery. The leading interest continues to quote 6.50c., New York, as its contract price.

Zinc.—The year closes with the market quiet, particularly as to demand for prime Western, which is quoted unchanged but firm at 6.35c., East St. Louis, or 6.70c., New York.

Antimony.—This market continues quiet, with the Chinese metal quoted at 9.87½c., New York, duty paid, for all positions.

Nickel.—Wholesale lots of ingot and shot nickel are quoted unchanged at 35c. and 36c., respectively, with electrolytic nickel in cathode form on the same basis as for ingot and shot nickel.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is quoted at 23.90c. per lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, Dec. 31.—Prices for copper and tin have been advanced, while quotations for antimony are lower. The aggregate of sales for the week is small. The old metal market is quiet.

Prices, per lb., in carload lots: Lake copper, 16.50c.; tin, 51c.; lead, 6.45c.; zinc, 6.45c.; in less-than-carload lots: antimony, 10.50c. On old metals we quote copper wire, crucible shapes and copper clips, 12.50c.; copper bottoms, 11.25c.; red brass, 10.75c.; yellow brass, 8.25c.; lead pipe, 5c.; zinc, 3.50c.; pewter, No. 1, 27c.; tin foil, 27c.; block tin, 39c.; aluminum, 12c., all being dealers' prices for less-than-carload lots.

Hearing on Ohio River Rail Link Jan. 14

WASHINGTON, Dec. 31.—The Interstate Commerce Commission has set Jan. 14 as the date for the hearing of the Pittsburgh & Lake Erie and Pennsylvania railroads regarding their attitude toward establishing connection between the Ohio River and the Youngstown district. It has been indicated that it may be necessary for the railroads to ask that the date be postponed, though no request for postponement has yet been made.

The hearing is the outgrowth of the commission's decision on the application of the Pittsburgh, Lisbon & Western Railroad to construct two branch lines which would connect the Youngstown district with the Ohio River. The commission said that authority to construct the proposed line will not be granted until it is fully satisfied that a use of the existing rail routes, those of the Pittsburgh & Lake Erie and the Pennsylvania, between the Ohio River and the Youngstown district will not produce substantially the same results. For this reason the commission held the record open in order that these two trunk lines might make their position clear.

Railroads to Continue Export Freight Rates

WASHINGTON, Dec. 31—Railroads in Central Freight Association and Trunk Line territories have notified the Interstate Commerce Commission that they have decided to continue in effect for the next six months, from Jan. 1 to June 30, 1929, tariffs providing a reduction of 20 per cent in rates on iron and steel products for export through Atlantic seaboard ports. These rates are 60 per cent of the domestic rates on iron and steel products in the affected territories and originally went into effect at midnight, Dec. 31, 1927. They were filed as "experimental" tariffs and their continuance was based upon the contingency of increased export shipments during 1928 over the preceding year. For the 11 months ended November, 1928, exports increased to 2,641,187 gross tons, or 31.2 per cent over the exports of 2,014,672 for the corresponding period of 1927.

Tonnage Rates for Boilers Advanced 25c.

Tonnage rates for boilers in mid-Western mills will be advanced to $11.80 per ton, from $11.55, as a result of the bi-monthly settlement. The higher rates will apply in January-February. Finishing mill hands will receive an increase of 2½ per cent of the base rate, as a result of increased average selling prices on shipments by subscribing mills for the 60-day period ended Dec. 20.

Chattanooga Furnace Being Dismantled

The blast furnace of the Chattanooga Iron & Coal Corporation, at Chattanooga, Tenn., has been sold to the S. C. Weber Iron & Steel Co., Chattanooga, and is being dismantled. Two Mesta blowing engines from the plant have been purchased by the Sloss-Sheffield Steel & Iron Co., Birmingham. The furnace was built in 1905-06, but had not been operated since 1920.

Alsimin Is Held Dutiable at 9c. Per Lb.

The United States Court of Customs Appeals in a recent decision held that alsimin, used in the manufacture of steel, should be classified under paragraph 374 of the Fordney-McCumber act, taking a duty of 9c. per lb., and not under paragraph 302, the "basket" clause, taking a duty of 25 per cent ad valorem. The decision reversed the finding of the United States Customs Court, which sustained the protest of importers that the alloy was dutiable under paragraph 302. Appraisers held that it was dutiable under paragraph 374, and the same contention was made by domestic manufacturers.

American Coal-Handling Dock for Manchuria

Contract for mechanical handling equipment for a modern coal loading dock to be erected by the South Manchuria Railway Co. at Dairen, Manchuria, has been awarded to the Alliance Machine Co., Alliance, Ohio. This contract amounts to approximately $500,000. German makers of handling equipment competed for the order. The unit will be of the type installed at Norfolk, Va., for the Virginian Railway, where one unit has a capacity of dumping two 60-ton cars of coal on an ocean liner in two minutes.

Morgan Engineering Co. Is Working Out of Difficulty

The Morgan Engineering Co., Alliance, Ohio, will be operated two years more under conditions similar to those in the past 25 months. Creditors recently decided to make this extension because of the good showing the company has been making. In the past two years the Morgan company has paid 25 per cent of its liquidating dividend, settled its large income tax liabilities, attained a good ratio of assets, retired a $500,000 bond series issued as collateral, kept up interest on its A series bonds and has met sinking fund requirements.

Sheet and Tin Mill Wage Rates Are Unchanged

YOUNGSTOWN, Dec. 31.—For January-February, tonnage rates of sheet and tin mill workers in mid-Western mills subscribing to the sliding scale wage agreement continue unchanged at 25½ per cent above base as a result of the bi-monthly examination of sales sheets. The examination revealed an average selling price of $3 per 100 lb. on Nos. 26, 27 and 28 gage black sheets shipped during the past 60 days. There has been no change in the average selling price for several bi-monthly periods, indicating price stability in steel sheets.

Orders for electric hoists during November increased 28.8 per cent in number as compared with the previous month, according to reports to the Electric Hoist Manufacturers Association, 165 Broadway, New York, while the value of such orders increased 23.5 per cent. Shipments were 6.4 per cent larger in November than in October.

Aircraft Industry at Threshold of Great Development

(*Continued from page 24*)

engine from F. L. Odenbreit, Los Angeles. Engine is of seven-cylinder, air-cooled, radial type.

B

Bach Aircraft Co., Clover Field, Santa Monica, Cal. Organized in September, 1927, to manufacture tri-motored 10 and 12-passenger monoplanes for passenger service. Company expects to produce 50 such planes in 1929 and plans 100 per cent expansion of facilities. Officers are: H. J. Heffron, president; L. Morton Bach, vice-president; Carl Faucett, secretary-treasurer.

Barbour-Stockwell Co., Instrument Department, Cambridge, Mass. Makes tachometers, adapters and fittings for airplanes. Its contemplated production of these accessories for 1929 is the same as the 1928 schedule, but allowance is being made for the possible 50 per cent increase. The company has been engaged in business since 1858 and its officers are: F. F. Stockwell, president; H. A. Stockwell, vice-president; F. F. Stockwell, secretary; E. F. Stockwell, treasurer.

Bellanca Aircraft Corporation of America, Wilmington, Del. Production in 1928 was two planes per week, but its schedule for 1929 calls for an expansion to a total of 300 six-passenger planes and other models. To provide for this increased output the company is adding about 30,000 sq. ft. of floor space. Work on the addition will be begun this month and completed in March. The company was organized in December, 1927, and its officers are as follows: G. M. Bellanca, president; Andrew Bellanca and R. R. Redington, vice-presidents; Andrew Bellanca, secretary; A. D. Chandler, treasurer.

Berliner Aircraft Co., Inc., Alexandria, Va. Production during 1928 was at the rate of one ship per week, but its schedule for 1929 provides for a minimum of 200 ships. A large modern plant will be available for occupancy in the spring. The company was organized in August, 1926, and its officers are as follows: Henry A. Berliner, president; Joseph Sanders, vice-president; John D. Smoot, secretary-treasurer.

Bird Wing Commercial Aircraft Co., Mid-America Airport, St. Joseph, Mo. Manufacturer of airplanes and operators of a school of aviation. John Batsell, president.

E. W. Bliss Co., Brooklyn. Having recently been licensed to manufacture Jupiter, Titan and Neptune airplane motors in the United States, the E. W. Bliss Co. is now in production on its first engines and expects to make its first delivery by Feb. 1. Production is now being centered on the Jupiter, a nine-cylinder engine, but later the company will also produce the Titan, a seven-cylinder engine, and the Neptune, a five-cylinder engine, all of which are built with interchangeable parts. These engines have long been built and used in Great Britain and companies in 16 other countries have also been licensed to build them. The Bliss company can give no estimate of its total 1929 production, but it expects to be able to produce not less than 100 engines a month when the volume of business justifies that expansion. Frank C. Page is president; F. D. Mackay, vice-president; James Skinner, secretary-treasurer.

Blue Streak Motors Co., Wichita, Kan. Company is developing an airplane motor, but has not yet gone in production. Officers are J. W. Watson, vice-president; Stewart M. Young, secretary-treasurer.

Boeing Airplane Co., Seattle, Wash. The 1928 production of this company was 140 airplanes, which will be expanded in 1929 to 250 airplanes. Company has plans for expansion of its plant and facilities during the coming year. It recently became a part of the United Aircraft & Transport Co., which also includes the Pratt & Whitney Aircraft Co., and the Chance Vought Corporation. Officers are: P. G. Johnson, president; C. L. Egtvedt, vice-president; O. W. Tupper, secretary; C. E. Brink, treasurer.

Brownback Motor Laboratories, 420 Lexington Avenue, New York. Will engage in the manufacture of airplane engines, utilizing the plant of the Light Mfg. & Foundry Co., Pottstown, Pa., for this purpose. Its plans are to make 600 80-hp. engines in 1929. It is also considering the manufacture of 50-hp. and 150-hp. engines, but has made no definite decision. Officers are: C. H. Phelps, president; H. C. Brownback, vice-president; H. W. Rinke, secretary-treasurer.

Brown Mercury Airplane Corporation, Los Angeles. Builders of a tri-motored airplane, known as the Brown-Mercury. R. T. Leonard, general manager.

Buhl Aircraft Co., Marysville, Mich. Originally organized as Buhl-Verville Aircraft Co., company builds several types of commercial airplanes at Marysville plant. Officers of company are: Lawrence D. Buhl, president; A. H. Buhl, vice-president; H. P. Smith, secretary and treasurer; Herbert Hughes, general manager.

Burdett Mfg. Co., 309 St. Johns Court, Chicago. Manufacturer of accessories for lighter-than-air craft.

Butler Airplane Corporation, Kansas City, Mo. Recently organized by the Butler Mfg. Co., which has long specialized in the manufacture of steel hangars and other airport equipment. The Butler Aircraft Corporation will be selling agents for airport equipment and airplanes to be manufactured by the Butler Mfg. Co. A large section of the Butler Mfg. Co.'s plant has been set aside for the manufacture of planes, and production on two types has already been begun. The company will specialize in all-metal craft. Its officers are: E. E. Norquist, president; William A. Knapp, vice-president; Roy S. Kemp, vice-president; F. A. Rufi, secretary; O. D. Nelson, treasurer; W. A. Stearman, designer.

C

Capital Aircraft Corporation, Lansing, Mich. Builder of a two-place, open-cockpit monoplane equipped with LeBlond engine.

Cardinal Aircraft Co., 800 Broadway North, St. Louis, Mo. Organized by men associated with the St. Louis Car Co., it will utilize the plant facilities of that company for manufacture. Production has just been begun, and the output for 1929 will depend upon the volume of sales. The company was organized on Aug. 8, 1928, with the following officers: Edwin B. Meissner, president; Sears Lehmann, vice-president; N. L. Rehnquist, secretary-treasurer.

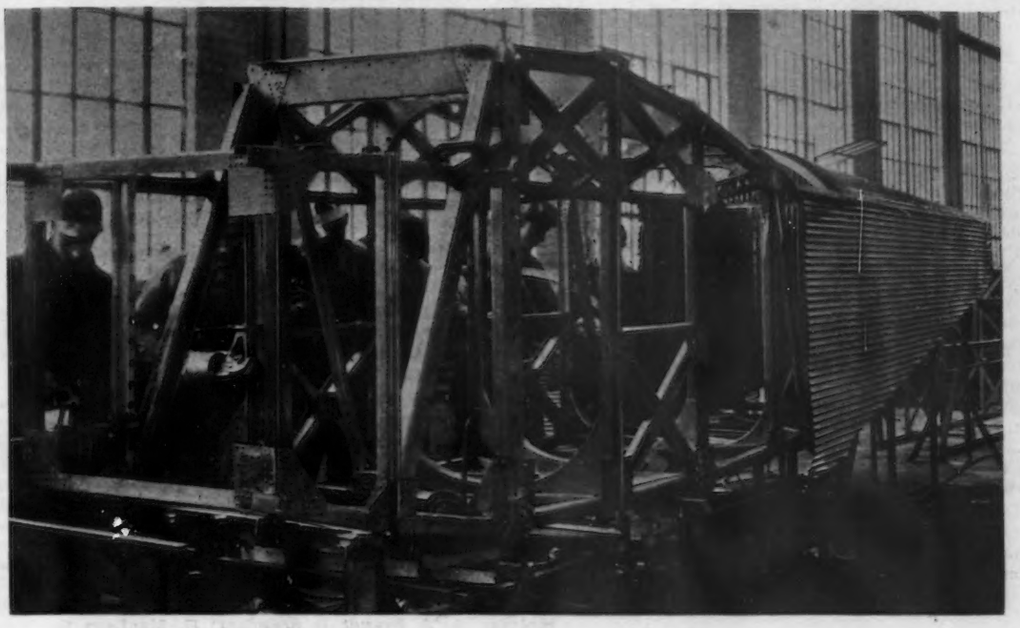
Cessna Aircraft Co., Wichita, Kan. Built and delivered more than 50 cabin-type planes during 1928, and the estimated production for 1929 is approximately 25 planes per month. New buildings were constructed and new equipment installed in January, 1928. Present facilities are probably sufficient for contemplated production this year. Officers are: Clyde V. Cessna, president; J. V. Verts, vice-president; E. T. Hargis, secretary-treasurer.

Chamberlin Aeronautical Corporation. Recently organized by Clarence Chamberlin, trans-Atlantic aviator, will occupy space jointly with the Crescent Aircraft Corporation in the former plant of the Clark Tread Co., 372 Lembeck Avenue, Jersey City, N. J. Mr. Chamberlin is technical adviser of the Crescent Aircraft Corporation. His own company will develop the type of aircraft different from that manufactured by the Crescent company, and possibly may later engage in building engines as well as planes. Production plans still are indefinite.

Chance Vought Corporation, Long Island City, N. Y. The output of this company, which was 175 airplanes in 1928, will be increased to 300 airplanes in 1929. At the present time the company's plant can handle contemplated schedule. Company has been in business since 1922. It recently became a part of the United Aircraft & Transport Co., which also includes the Boeing Airplane Co. and the Pratt & Whitney Aircraft Co. Its officers are: George W. Vought, president; Robert B. Knowles, vice-president; Ena Lewis Vought, secretary-treasurer.

Chevrolet Aviation Motors Corporation, Tenth and Fayette Streets, Indianapolis, Ind. Company is experimenting in the production of airplane motors, and recently has been working on a contract for the rebuilding of a considerable number of used motors. Its production schedule for 1929 is not yet determined, but company plans on expanding its present facilities for engine manufacture. It was organized April 20, 1921, and its officers are: Arthur Chevrolet, president; Gordon F. Griffin, vice-president; Otto Kuehrmann, secretary-treasurer.

Coffman Aircraft Co., Oklahoma City, Okla. Has acquired the local plant of a motor car manufacturer for the production during the coming year of a cabin monoplane. Has also secured the property in Oklahoma City of the Southwest Airways Co., including a flying field and will construct a



All-metal Construction of Airpanes Produced by the Hamilton Metalplane Co., Milwaukee, Indicative of Growing Use of Steel and Alloy Metals for Aircraft

hangar, repair shop and other units. D. J. Marshall is president.

Consolidated Aircraft Corporation, 2050 Elmwood Avenue, Buffalo. Specializes in building of training planes for Army and Navy and for military services of foreign countries. R. H. Fleet is general manager.

Consolidated Instrument Co. of America, 41 East Forty-first Street, New York. This company specializes in airplane instruments. It gives no details regarding its plans for 1929 further than to say that expansion of plant and facilities is contemplated. The company was organized in 1920 and its officers are: Joseph Leopold, president; F. Kenneth Gundlach, vice-president; Hugh W. Gallaher, secretary-treasurer.

A. Wellington Cook, Washington, R. I. Engaged in experimental building of airplanes, but not yet producing on a commercial scale.

Crescent Aircraft Corporation, 261 Broadway, New York. Formerly located at Lindenhurst, Long Island, this company has closed that plant and has recently purchased the plant of the Clark Thread Co., 372 Lembeck Avenue, Jersey City, N. J. It has recently completed its first plane, but will undergo refinancing before going into production at its new plant. Officers of the company will be elected as soon as the financing has been completed. Clarence Chamberlin, trans-Atlantic aviator, is the company's technical adviser.

Curtiss Aeroplane & Motor Co., Inc., Garden City, N. Y. Organized in May, 1923, to succeed Curtiss Aeroplane & Motor Corporation, a business established in 1904, to manufacture airplanes and motors. Plants are operated at Buffalo and Garden City, N. Y., with annual production capacity of 1500 planes and 1500 engines, and experimental plant at Garden City is completely equipped with aerodynamic laboratory and other facilities for aeronautical research. Lrge plant extension now under construction at Buffalo will enable company to greatly increase output in 1929. Prior to 1928, production had been largely for United States Government, but through the formation of the Curtiss-Robertson Company, St. Louis, and its own operations, company is rapidly developing commercial business of considerable proportions. Products include planes ranging in size from small opening training model, powered with Challenger motor, to two-pilot, 20-passenger type with two 600-hp. Curtiss motors, several types of motors, propellers, the Curtiss Oleo wheel, oil temperature regulators, wing radiators, complete landing gears, fuel and oil tanks and other accessories. Through its subsidiary, Curtiss Flying Service, Inc., the company engages in every phase of commercial flying activity and is now planning to offer taxi service by airplane to any place in country where it is possible for planes to land and take off. This subsidiary will also act as sales agent for Curtiss products and through a recent agreement with Douglas Aircraft Co., Santa Monica, Cal., it will act as agent for products of that company. Recent acquisition of the Reid Aircraft Corporation has given the company a Canadian subsidiary. Officers of the Curtiss organization are: C. M. Keys, president; C. R. Keys, Leonard Kennedy, F. H. Russell and William E. Valk, Jr., vice-presidents, and J. A. B. Smith, secretary and treasurer.

Curtiss-Robertson Airplane Mfg. Co., Anglum, St. Louis County, Mo. Production for the fiscal year, Aug. 1, 1928 to July 1, 1929, will be approximately 400 planes, and its contemplated schedule for the period from July 1, 1929 to July 1, 1930, is 600 planes. The company was organized in January, 1928, with the following officers: William B. Robertson, president; J. D. Livingston, secretary-treasurer; C. M. Keys, vice-president.

Cunningham-Hall Aircraft Corporation, 13 Canal Street, Rochester, N. Y. Company was organized in September, 1928, and its plans for production are still incomplete. Officers are: F. E. Cunningham, president; J. C. Dryer, first vice-president; R. R. Hall, second vice-president; W. R. R. Winans, secretary; J. W. Fulreader, treasurer.

D

Dayton Airplane Engine Co., Leo Street and Baltimore & Ohio Railroad, Dayton, Ohio. Organized in 1927, with capital of $1,000,000, to manufacture Dayton Bear gasoline aircraft engines. Company has secured Department of Commerce manufacturing license and expects to go into production early this year, and will probably turn out 1000 engines during 1929. Company operates its own machine shop and expects to purchase additional machine tools and other equipment during year. Officers are: R. R. Grant, president and general manager, and G. A. Funkhouser, secretary and treasurer.

DeMuth American Aircraft Corporation, Chamber of Commerce Building, Boston. Company has several prospective manufacturing plants under consideration for purchase, and until a decision is reached on a location the company's plans for 1929 production are uncertain. Planes will be built.

Detroit Aero Motors Co., 10331 Charlevoix Avenue, Detroit, Mich. Builders of aircraft motors, aeronautical instruments, metal propellers, spare parts for airplanes and general aero equipment.

Douglas Aircraft Co., Santa Monica, Cal. Recently organized to take over the Davis-Douglas Co., also of Santa Monica, manufacturer of military airplanes. New company plans expansion in facilities with installation of equipment for production of commercial aircraft.

Doyle Aero Corporation, 121 South Howard Street, Baltimore. Two planes were manufactured by this company in 1928, and its contemplated production for 1929 is 50 planes. The company was organized in 1928 with the following officers: Harvey Doyle, president; Allan Davis, vice-president; Donald Primrose, secretary; Wilson Doyle, treasurer.

Driggs Aircraft Corporation, Lansing, Mich. Organized in 1927, with capital of $100,000, to manufacture airplanes, equipped

with Moorehouse engine. Officers are: H. F. Harper, president; Ivan H. Driggs, vice-president and general manager; E. C. Shields, secretary, and H. B. Lundberg, treasurer.

E

Eberhart Aeroplane & Motor Co., Inc., Hamburg, N. Y. Manufacturer of aircraft camera mounts, lighting equipment, parachutes, superchargers and airplane tanks. Have built one experimental airplane for the United States Army. Cleburne Eberhart is president.

Edo Aircraft Corporation, College Point, Long Island, N. Y. Manufactured 100 airplane floats in 1928, but its 1929 schedule has not been definitely determined. The company was organized in 1925, and its officers are: Earl D. Osborn, president; George B. Post, vice-president; K. D. Vosler, secretary-treasurer.

G. Elias & Brother, Inc., 965 Elk Street, Buffalo. Engaged in airplane manufacture during the war, and since then has been specializing in planes for the Army and Navy. Now it will manufacture commercial planes. A factory site has been purchased at the Buffalo airport and a new plant will be built. Estimated production for 1929 is 300 commercial planes. A. J. Elias is president; A. A. Nessler, vice-president and general manager; Lawrence Koch, secretary; Joseph Kreuger, treasurer; Joseph Cato, production engineer.

Emsco Aero Engine Co., Municipal Airport, Los Angeles. Engaged in experimenting with building Diesel motors for aircraft. E. M. Smith is president.

F

Fairchild Aviation Corporation, 270 West Thirty-eighth Street, New York. Manufacturing subsidiaries of this company are the Fairchild Airplane Mfg. Corporation and the Fairchild Caminez Engine Corporation. Other subsidiaries are the Fairchild Aerial Camera Corporation, Fairchild Aerial Surveys, Inc., and the S. M. Fairchild Flying Corporation. The airplane division has recently completed and occupied a modern plant at Farmingdale, Long Island, designed for quantity production, with straight-line assembly patterned after that used in large automobile plants. Equipment has been installed for the stamping of the structural members and the ailerons on the Fairchild 21 and Fairchild 41 planes. The 1928 production of the company was 165 airplanes in two models, and in 1929 it expects to produce a total of 1150 planes in three models. The Fairchild Caminez Engine Corporation has recently been engaged in experimental work only, but plans to begin production soon of a foreign motor. Officers of the manufacturing companies are the same and are as follows: President, G. B. Grosvenor; vice-president, E. Robinson; secretary-treasurer, Harold Kondolf; assistant secretary, G. R. Pearson.

Federal Aircraft Corporation, 154 Slauson Avenue, Los Angeles. Manufacturer of airplanes.

Fokker Aircraft Corporation of America, Hasbrouck Heights, N. J. Organized in November, 1927, to succeed Atlantic Aircraft Corporation, which had been organized in December, 1923, to manufacture planes designed by Anthony H. C. Fokker. New Jersey factories are located at Teterboro Airport, Hasbrouck Heights, and Passaic, the former having been established in 1924, and which have a total manufacturing space of 377,500 sq. ft. Company also operates plant at Glendale, W. Va., with 100,000 sq. ft. of floor space, and plans a plant of 500,000 sq. ft. near Los Angeles, of which the first unit of 100,000 sq. ft. will be begun immediately. Factory output in 1928 was valued at approximately $2,000,000 and estimated output for 1929 will be not less than $6,000,000. Company's line of planes embraces wide range of models, all of which will be produced on quantity basis in 1929.

K. G. Frank, 75 West Street, New York. As direct representative of the German manufacturer, Siemens & Halske A. G., K. G. Frank is handling sales in this country of radial, air-cooled aircraft motors of 80, 100, 110 and 125 hp. There are about 120 motors of this make in the United States at present, which have been sold in slightly more than a year. The company is now equipped to triple its production and plans either to license an American manufacturer to operate under its patents, or enter into one or more contracts for all its output available for shipment to the United States.

G

Gaertner Scientific Corporation, 1201 Wrightwood Avenue, Chicago. For last four or five years company has been manufacturing aeronautical instruments, chiefly for military purposes, such as bomb sights, vertical view finders and oxygen feeding apparatus, etc. Company does not expect to increase production materially during 1929. Officers are: William Gaertner, president; R. E. Schmidt, vice-president; O. M. Laing, secretary; William Gaertner, treasurer.

Gates-Day Corporation, Paterson, N. J. Recently purchased a large plant and will expand its production to a total of about 250 airplanes in 1929. The 1928 output was 10 planes. The company was organized in July, 1928, with the following officers: Ivan R. Gates, president; Charles Healy Day, vice-president; George Daws, secretary; Reuben Reiffen, treasurer.

General Aircraft Corporation, Hazleton, Pa. Builders of small commercial airplanes under the trade names of Pilot and Navigator airplanes. Bayard Stewart is chief engineer.

General Airmotors Corporation, Scranton, Pa. Organized in September, 1928, has not yet got into production, but plans on a tentative schedule of 1000 motors for 1929. It has engaged a plant in Scranton for manufacturing, and there may be some expansion of facilities during this year. Its officers are: L. H. Watres, president; Paul W. Gardner, secretary; Frank Hummler, treasurer.

General Airplanes Corporation, 555 Abbott Road, Buffalo. Organized in June, 1928, has for some time been occupied in experimental work and is not yet in production, though the company expects to be in the near future. One hundred men are employed at the present time in a temporary building. The production schedule for 1929 is completed. Will manufacture two models, a three-place, cabin monoplane, The Aristocrat, powered by a Warner-Scarab motor and the Photographic, a plane capable of being converted to a passenger plane, and powered by a twin Wright engine. Plant is merely for the manufacture of planes and not motors. A. J. Brandt is president; G. MacLean Gardner, vice-president in charge of manufacturing; A. Francis Arcier, vice-president in charge of engineering; George A. Townsend, secretary, and L. A. Listug, secretary.

Gillis Aircraft Corporation, 48 Barney Street, Battle Creek, Mich. Company has discontinued production for the present, but may again engage in production some time this year. C. H. Gillis is president.

Goodyear Zeppelin Corporation, Akron, Ohio. Organized recently to build two large dirigibles for the Navy Department. This company, which is a subsidiary of the Goodyear Tire & Rubber Co., will shortly start the erection of a large hangar that will include considerable equipment for manufacturing the airships. This company will not engage in the manufacture of airplanes. Dr. Carl Arnstein is vice-president and chief engineer of the company.

Great Lakes Aircraft Corporation, Cleveland. (See Glenn L. Martin Co.). Recently purchased Martin plant in Cleveland and announces that it will build large air mail planes capable of carrying three times present maximum load, and with facilities for mail clerk to sort mail en route. William R. Wilson, Chicago, formerly president Murray Body Co., is chairman of board.

H

Hall Aluminum Aircraft Corporation, 2050 Elmwood Avenue, Buffalo, N. Y. Not producing commercial air crafts at present, but is working on two contracts for the United States Navy. The company was organized in September, 1927, and its officers are: Charles Ward Hall, president; Archibald M. Hall, vice-president; Charles F. Pape, secretary and treasurer.

Hallett Aero Motors Corporation, 523 South Redondo Boulevard, Inglewood, Cal. Recently organized to manufacture airplane engines by Hallett Mfg. Co., Los Angeles, which operates foundry and machine shop for the manufacture of air compressors and marine engines. Additional capacity being provided to take care of airplane engine production.

Hamilton Aero Mfg. Co., Milwaukee. Manufacturer of metal and wood airplane propellers and metal pontoons. Production in 1928 was 1100 metal propellers (duralumin), 2500 wood propellers; total value, $550,000. Production schedule for 1929 calls for about $1,000,000 worth of propellers. Plant has just been increased from 18,000 sq. ft. to 68,000 sq. ft. of floor space, and the shop facilities have been tripled. Company was organized in 1909, and from it sprang the Hamilton Metalplane Co., which is an entirely separate organization. Officers are: President, Thomas F. Hamilton; vice-president, August H. Vogel; secretary, E. I. Hamilton; treasurer, Thomas F. Hamilton.

Hamilton Metalplane Co., Milwaukee. Production in 1928 was 25 all-metal cabin monoplanes; schedule for 1929 is 50 to 100 planes, with a total value of $1,000,000 to $2,000,000. Plant has undergone constant and gradual expansion; continued expansion is expected, depending on the market and development of plans now under discussion. Company was organized in October, 1927, through efforts of Milwaukee

Association of Commerce and by means of a financing corporation effected by the association. Officers are: President, Thomas F. Hamilton; vice-president, Clarence R. Falk of the Falk Corporation; secretary, William F. Pabst; treasurer, Rudolf Hokanson.

Hartzell Propeller Co., Piqua, Ohio. Manufacturer of propellers for aircraft. Robert Hartzell is manager.

Heath Airplane Co., 1727 Sedgewick Street, Chicago. Built 100 planes in 1928; estimates that 300 planes will be built in 1929. Company organized in 1908. President, E. B. Heath; vice-president, Alvin Green; secretary-treasurer, Mrs. A. M. Johnston.

Heywood Starter Corporation, 6547 St. Paul Street, Detroit. Manufactures starters for airplanes, 300 of which were produced in 1928, and the schedule for 1929 calls for an output of between 1000 and 1500. No plant expansion is contemplated. The company was organized in May, 1925, as the Detroit Air Appliance Corporation and reorganized in May, 1928, as the Heywood Starter Corporation. Its officers are: President, S. L. McKay; vice-president and treasurer, H. V. Wilkie; secretary, F. B. Stover.

Hide, Leather & Belt Co., Indianapolis, Ind. This company's production of safety belts for airplanes in 1928 was approximately 1000, and it expects to double this output during 1929. The company has been in business since 1870. Its officers are: A. G. Snider, president; A. E. Snider, vice-president; A. T. Cox, secretary-treasurer.

Huntington Aircraft Corporation, Bridgeport, Conn. At present engaged in engineering work in preparation for production, company will soon build first unit of manufacturing plant with 40,000 sq. ft. of floor space. Production schedule for 1929 is 36 planes. Organized in June, 1928, company elected the following officers: Howard Huntington, president; Chester Huntington, vice-president; L. MacMillan, assistant secretary.

I

Imbium Aeronautic Co., 430 Webster Street, Pueblo, Colo. Will build new plant this year to cost about $200,000 with machinery for production of airplane parts and assembling of airplanes.

International Aircraft Corporation, Broadwell Road, Ancor, Ohio. Organized in 1927 to manufacture airplanes. Production in 1928, 36 airplanes; production schedule for 1929, three airplanes a week, or approximately 150 for the year. Company has just gone through a period of refinancing. Officers are: Clarence E. Ogden, chairman of the board and treasurer; Arthur H. Ewald, president; E. J. Wade, general manager and assistant treasurer; Harold A. Speer, vice-president in charge of sales; Edwin M. Fisk, chief engineer and secretary; A. W. Roth, assistant secretary.

International Life-Saving Water-Making Cup Corporation, 204 Woodward Building, Washington. Production in 1928 was small, but the plant is now fully equipped and in a position to turn out 4000 or more Life-Saving water-making cups per day. The company was organized in April, 1927, with the following officers: Charles W. Armbrust, president; Dr. LaMott Day, vice-president; Abram F. Servin, secretary; Frank Addison, treasurer.

Indian Motocycle Co., Springfield, Mass. Negotiations are under way, but have not formally been completed by which this company may utilize a portion of its plant for the manufacture of airplane engines. Officers are: Claude Douthit, chairman of board; Louis E. Bauer, president; William E. Gilbert, vice-president; Thomas M. Darrah, treasurer.

Ireland Aircraft, Inc., Garden City, Long Island. N. Y. From a production of nine amphibians in 1928, this company expects to expand to an output of 30 in 1929. No definite plans have been made for increase of plants or facilities. The company was organized in 1926, and its officers are: Bertram Work, president; D. J. Brimm, Jr., secretary-treasurer

Irish Aircraft Co., Water and Meigs Streets, Sandusky, Ohio. Manufacturer of airplanes.

Irwin Aircraft Co., 126 O Street, Sacramento, Cal. Builder of small commercial and sport type airplanes, under the name of Meteor. C. Warren Cole is sales manager.

Irving Air Chute Co., Inc., 523 Main Street, Buffalo. Organized in 1919, and is engaged in selling parachutes to the United States Army, Navy and Department of Commerce and to 30 foreign countries. The Irving company maintains a factory in Letchworth, England, in addition to the Buffalo plant, and supplies the parachutes used by the British Air Force. It has already supplied 4000 chutes to the air forces of Great Britain. Production in 1929 will be approximately 50 per cent greater than in 1928 because of increase in orders from foreign countries. Officers are: President, George Waite; vice-president, Leslie L. Irvin; secretary, Leslie L. Irvin; treasurer, George Waite.

J

Jewell Electrical Instrument Co., 1650 Walnut Street, Chicago. Manufactures indicating instruments for airplanes, production thus far having been limited to special milliammeter for Pioneer earth inductor compass and special instruments for bombing control on Army and Navy planes. Further production is based entirely upon demand. Officers of company are: Orval Simpson, president; Raymond Simpson, vice-president; A. F. Klink, secretary and treasurer.

Johnson Aircraft Corporation, Dayton, Ohio. Company not in production, but is trying out several new motors in an effort to find one that can be used successfully in its plane. Production plans are being held in abeyance until decision is made regarding the motor to be used. An affiliated company is Johnson Airplane & Supply Co., engaged in the distribution of aeronautical supplies.

K

Keystone Aircraft Corporation, Bristol, Pa. Recently completed a 20-passenger airplane. The total output of 1928 was rated at $1,750,000, and its production schedule for 1929 calls for an output valued at $3,000,000. The company plans enlargement of its main manufacturing building and the erection of a new office building. It was organized in 1917 and its officers are as follows: President, E. N. Gott; vice-presidents, Albert P. Loening, C. Talbot Porter and C. L. Roloson; treasurer, L. W. Townsend.

Kimball Aircraft Corporation, Naugatuck, Conn. This company will begin production on the Beetle seven-cylinder, 135 hp. radial engine as soon as experimental work and test to be conducted by the United States Bureau of Standards are completed. Later may also build Gnat, two-cylinder opposed, 25 hp. engine. Expansion of plant and facilities is contemplated as soon as production of engines is begun. The company was organized in July, 1928, and its officers are: L. B. Kimball, president; C. L. Klein, vice-president; C. S. Austin, secretary; Harris Whittemore, Jr., treasurer.

Kinner Airplane & Motor Corporation, Glendale, Cal. Production schedule for 1929 is 1000 aircraft motors which will quadruple its recent output. The company was organized in 1919 and its officers are as follows: Chairman of board, Robert Porter; president, W. B. Kinner; vice-president, B. L. Graves; secretary-treasurer, R. E. Olin.

Knoll Aircraft Corporation, 471 West First Street, Wichita, Kan. Company is said to be planning construction of a new airplane manufacturing plant near Wichita municipal airport. T. N. Thomas is president.

Kreider-Reisner Aircraft Co., Inc., Hagerstown, Md. Organized in 1927, company operates plant at Hagerstown for manufacture of biplane, known as Challenger, utilizing a Curtiss engine unit. Production in 1928 was 100 planes, and contemplated output for 1929 is 250. A. H. Kreider is president and treasurer; L. E. Reisner, vice-president; J. K. Baker, Jr., secretary.

Kreutzer Corporation, Los Angeles. Manufacturer of aircraft equipment and accessories, and recently has entered into building airplanes on a small scale. Joseph Kreutzer is president.

L

C. C. Laird Aircraft Corporation, 471 West First Street, Wichita, Kan. Manufacturer of commercial aircraft. H. D. Cottman is president.

E. M. Laird Airplane Co., 4500 West Eighty-third Street, Chicago. Built 25 planes in 1928; will build 75 planes in 1929. Has just completed plant additions that double floor space and provide for 300 per cent increase in production in 1929. Company organized in 1912. E. M. Laird, president; Lee Hammond, vice-president; Charles Arens, secretary; E. M. Laird, treasurer.

Lake Shore Aviation Co., Port Clinton, Ohio. Manufacturer of airplanes.

Lark Aircraft Co., Wichita, Kan. Manufacturer of airplanes.

La Salle Aircraft Corporation, Ottawa, Ill. Recently organized to manufacture airplanes. Company intends to build plant and has leased 71-acre tract for airport and factory sites.

LeBlond Aircraft Engine Corporation, Madison and Edwards Roads, Cincinnati. Organized in 1928 to manufacture LeBlond gasoline airplane engines. Production in 1928, 65 engines; expects to get onto production basis of four engines daily within 60 to 90 days. Year's output probably will be 750 or 800 engines. Expansion of manufacturing

space contemplated, but will use present LeBlond machine tool plant for purposes. May buy some additional equipment. Richard E. LeBlond, president and general manager; Glenn D. Angle, vice-president and engineer; H. C. Pierle, secretary; E. G. Shultz, treasurer.

Lenert Aircraft Co., Pentwater, Mich. Recently organized to manufacture metal aircraft. No word received as to company's production plans.

Lincoln Aircraft Co., 2409 O Street, Lincoln, Neb. Builder of small airplanes, under the name Lincoln-Page.

Lockheed Aircraft Co., Los Angeles, Cal. Total unfilled orders estimated at more than $1,000,000, and the company's expansion plans call for stepping up of operating schedules from 12 planes a month to possibly double that number. With enlarged plants at Los Angeles and at Chicago, the company is equipped to handle contemplated 1929 production.

Loening Aeronautical Engineering Corporation, 420 East Thirty-first Street, New York. Produced 70 planes and spare parts during 1928 and expects to go on a production basis of two planes a week this year. Company was recently purchased by the Keystone Aircraft Corporation, Bristol, Pa., and its officers are the same as those of the Keystone company.

Lycoming Mfg. Co., Williamsport, Pa. Has recently completed successful tests of two airplane engines, and production will be begun about March 1. John H. McCormick is president and general manager; W. H. Beal, vice-president; H. V. Beach, treasurer; Raymond S. Pruitt, secretary.

M

Mahoney-Ryan Aircraft Corporation, Anglum, St. Louis County, Mo. Organized in January, 1927, to succeed B. F. Mahoney Aircraft Corporation, San Diego, Cal., which in turn succeeded Ryan Air Lines, Inc. Mahoney corporation built plane used by Col. Charles A. Lindbergh in transatlantic flight. Plant was later moved to St. Louis. Built 135 planes in 1928 and production schedule this year calls for 200 planes. Officers of the corporation are: Philip DeC. Ball, chairman of board; John C. Nulsen, vice-president, treasurer and general manager; H. H. Knight, secretary.

McCarthy Aircraft Co., Portland, Mich. Manufacturer of airplanes. George L. McCarthy is president and general manager.

Marshall Aircraft Co., Marshall, Mo. Preparing to build airplanes, but has not yet gone in production.

Glenn L. Martin Company, Cleveland. This company, having sold its plant and all manufacturing equipment at Cleveland to the Great Lakes Aircraft Corporation, which was formed by Chicago investment banking interests, has acquired a site at Baltimore on which it will build a new plant of 300,000 sq. ft. to be fully equipped with new machinery for the manufacture of airplanes. In the past year at Cleveland, the Martin company built 102 planes for the United States Navy and its total production was about 130 planes. The 1929 production has not been definitely determined, but probably will be considerably larger than that of last year. The Great Lakes Aircraft Corporation, which will take over the Martin plant at Cleveland, will specialize in commercial airplanes. The Martin company has been engaged in airplane manufacture since 1909. Its officers are: Glenn L. Martin, president; C. A. Van Dusen, vice-president; Thomas A. Jones, secretary; M. G. Shook, treasurer.

Mayer Aircraft Corporation, Bridgeville, Pa. This company recently organized by C. P. Mayer to manufacture cabin-type monoplanes. No word received as to company's production plans.

Metal Aircraft Corporation of Cincinnati, Lunken Field, Cincinnati. Organized in 1928 to manufacture all-metal airplanes. Production in 1928 consisted only of experimental machines. Expects to produce from 50 to 75 airplanes this year. Recently erected new plant and possibly may add some equipment in 1929. Henry C. Yeiser, Jr., president; Julius Fleischman, vice-president; John B. Hollister, secretary; Thomas C. Halpin, general manager; Ralph R. Graichen, chief engineer; William E. Shaefer, production manager.

Michigan Screw Co., Lansing, Mich. Has been engaged in experimental work on a four-cylinder in-line, air-cooled airplane motor, designed by Howard Moorehouse, formerly of McCook Field, and plans commercial production this year. Motor, under the name Rover, was recently exhibited at the Chicago Aeronautical Exposition. Officers of the company are: H. B. Lundberg, president and general manager; Ray Potter, vice-president and treasurer; C. R. Morris, secretary.

Mohawk Aircraft Corporation, Minneapolis. Organized in September, 1926, company produced 30 planes in 1928 and production schedule for 1929 calls for 300 planes, with further expansion of airport facilities. Officers of company are: Stanley Partridge, president; Col. Gerald P. Murphy, vice-president and general manager; S. E. Whitney, secretary and treasurer.

Monarch Aircraft Co., Riverside, Ill. Produced 10 airplanes in 1928, and its contemplated production for 1929 is 25 planes. Expansion of plant and facilities is under consideration, but no definite decision has been reached. The company was organized in November, 1927, and its officers are: President, Arthur W. Roza; vice-president, Frank W. Stahle; secretary, Florence Stahle; treasurer, Frank Stahle.

Mono Aircraft Co., Moline, Ill. Manufacturer of a small cabin monoplane under the name Mono-Coupe. The Velie Motor Co. is a large stockholder in the company and the airplane is equipped with a Velie motor.

K. W. Montee Aircraft Co., Clover Field, Santa Monica, Cal. Manufacturer of airplanes.

Moto Meter Co., Inc., Long Island City, N. Y. Recently organized an aviation division for production of aircraft instruments, including fuel, pressure and other gages, a new ice-warning device and other products. New division will supervise sale of such instruments now being built by its subsidiary, National Gauge & Equipment Co., La Crosse, Wis. Henry Boynton is head of new department.

Moundsville Airplane Corporation, P. O. Box 85, Moundsville, W. Va. Manufacturer of airplanes on a small scale.

H. C. Mummert, Hammondsport, N. Y. Builder of racing type airplanes, but not on a commercial scale. H. C. Mummert is president.

N

National Aero Corporation, 100 East Forty-second Street, New York. Recently organized, this company has taken over the new plant of Huff Airplanes, Inc., at Perth Amboy, N. J., which has 56,000 sq. ft. of floor space, and will manufacture air-cooled airplane engines. The first lot of 100 engines is now in production and a total output for 1929 of about 800 engines is scheduled. Officers of the company are: E. S. Cameron, president and designer; E. M. Roberts, vice-president; J. W. Cox, Jr., treasurer; A. C. White, production manager.

National Airways System, Lomax, Ill. Company is equipped for a fair volume of production, but has not been an active builder recently. Manufacture airplanes under the name of Air King.

Neilson Steel Aircraft Corporation, Second and Camelia Streets, Berkeley, Cal. Organized recently and has not yet produced any plane. Thomas Neilson is president.

Claude Neon Lights, Inc., 50 East Forty-second Street, New York. Company's business in Claude Neon tubes for aeronautical use has assumed large proportions. Recent business has included a large number of Neon luminous tube letters installed on roofs of buildings to mark name of town for benefit of aviators. Company has also installed a large number of Claude Neon beacons and illuminated wind direction indicators. A large plant is being built in Pittsburgh, one has just been completed in Buffalo and another will soon be underway in Schenectady. Officers are: W. T. P. Hollingsworth, president; R. L. Kester, Jr., vice-president; A. P. W. Seaman, secretary; William Franksen, treasurer.

Nicholas-Beazley Airplane & Motor Co., 226 West North Street, Marshall, Mo. Dealer in parts and accessories for aircraft and has recently developed an airplane, which is now being tested. Russell Nicholas is president.

Niles Aircraft Corporation, Niles, Mich. Manufacturer of airplanes.

Norman Aircraft Co., Burlington, N. J. Recently organized and took over property at Barcley and Stacy Streets, Burlington, for the production of airplanes. Initial operations devoted primarily to assembling.

O

Ohio Aero Mfg. Corporation, Youngstown. Experimental plane has recently passed flight tests and production on a moderate scale will be begun within a few weeks.

P

Packard Motor Car Co., Detroit. Company is developing air-cooled radial Diesel engine, reported to weigh approximately

3 lb. per hp. Officers of company are: Alvan Macauley, president; Henry E. Bodman, vice-president; Merlin A. Cudlip, secretary, and H. J. Ferry, treasurer.

Paramount Aircraft Co., Saginaw, Mich. Builder of four-passenger cabin airplane. J. E. Behse is president.

Paramount Welded Aluminum Products Corporation, 195 Morgan Avenue, Brooklyn. Company has recently moved to its present address, where it occupies 14,000 sq. ft. of floor space for the manufacture of airplane fuel and oil tanks, engine conning, pilot seats, and various other aircraft products. Machine tools and other factory equipment have recently been purchased. This company has had a recent large increase in sales which necessitated the leasing of larger factory space. J. H. Billig is president.

Parks Aircraft, Inc., East St. Louis, Ill. Produced three test airplanes in the past year, and its production schedule for 1929 is 1200 planes. It is erecting a new manufacturing building, the first unit of which will be 100 x 380 ft., and two additional units will be built some time this year. The company was organized in 1928. Its officers are as follows: President, Harry P. Mammen, Missouri Theater Building., St. Louis; vice-president, Oliver L. Parks; secretary, Thomas Reyburn; treasurer, Fred Gardner, Gardner Motor Co., St. Louis.

Phantom-Knight Aircraft Corporation, Oak Park, Ill. Manufacturer of commercial, three-place, open cockpit, single-bay biplanes. Harold Pearson in charge.

Pheasant Aircraft Co., Inc., Memphis, Mo. Manufacturer of airplanes under the name of Pheasant. Production small.

Pioneer Instrument Co., Brooklyn. Specializing in navigating instruments for aircraft, this company has had an increasing demand for its products and contemplates an addition to its plant to be built in 1929 that will add about 50 per cent to its capacity. The company has been in business since 1919. Its officers are as follows: President, Charles H. Colvin; vice-president, H. F. Colvin; secretary, B. Davis; treasurer, Hermon F. Owen.

Pitcairn Aviation, Inc., Land Title Building, Philadelphia. This company produced 52 planes in 1928, mostly for the United States Mail Service, and its contemplated production for 1929 is 100 planes. Factory additions will be built this year to provide for an expansion in output. Officers are: Harold F. Pitcairn, president; Geoffrey S. Childs, vice-president; Kesnell C. Acton, secretary.

Pratt & Whitney Aircraft Co., Hartford, Conn. Produced 1000 Wasp and Hornet airplane engines in 1928 and expects to increase its output in 1929 to 1800 units. No further expansion of plant or facilities is contemplated for the coming year. Recently became a part of the United Aircraft & Transport Co., which also includes the Chance Vought Corporation and the Boeing Airplane Co. The company was organized in July, 1925, and its officers are as follows: F. B. Rentschler, president; G. J. Mead, vice-president; C. W. Deeds, secretary-treasurer; H. M. Horner, assistant treasurer.

Prudden-San Diego Metal Airplane Co., San Diego, Cal. Built only one plane in 1928, but will probably build not less than eight in 1929. Company has no definite plans for expansion. It was organized in April, 1927, with the following officers: B. B. Starke, president; B. W. Sinclair and E. T. Price, vice-presidents; B. H. Taylor, secretary; H. S. Richards, treasurer.

Q

Quick Air Motors Co., Wichita, Kan. Builder of an air-cooled airplane motor on a small scale.

R

Red Bird Aircraft Corporation, 1513 North Fonshill Street, Oklahoma City, Okla. Recently took over building at this address formerly used for motor truck manufacture and has remodeled for the manufacture of airplanes. Formerly located at Bern, Kan.

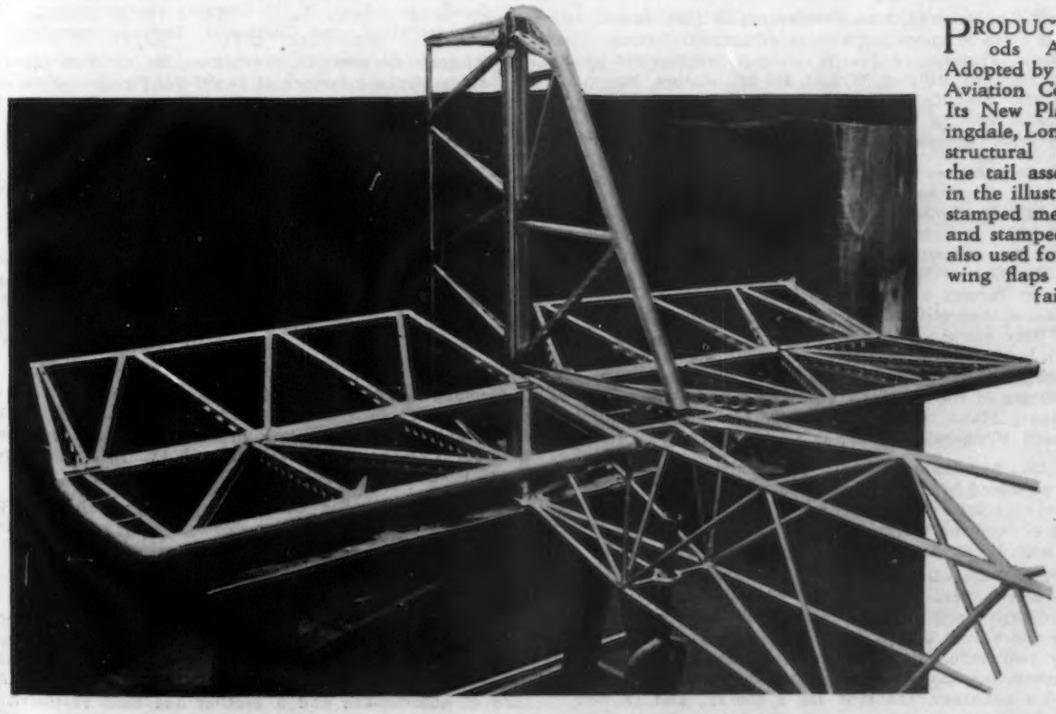
S

San Francisco Aircraft Specialties Corporation, San Francisco. Recently formed by J. R. Gilbert, 408 Warren Road, San Mateo, Cal., and associates, and is planning construction of a new plant for airplane production, including parts production and assembling.

Scintilla Magneto Co., Sidney, N. Y. Stock purchase recently concluded by which the Curtiss Aeroplane & Motor Co., the Wright Aeronautical Corporation and the Pratt & Whitney Aircraft Co. acquired a third interest. Output of Scintilla aircraft magnetos is about 100 a day. Expansion program under way includes a new factory building which will add 40,000 sq. ft. of floor space.

Seversky Aero Corporation, New York. This company is not yet engaged in manufacture.

Sikorsky Aviation Corporation, College Point, Long Island, N. Y. The 1928 production of this company was 11 of type S-38 airplanes, one bomber and one passenger ship. The 1929 schedule calls for the production of 100 Sikorsky amphibions, type S-38. To provide for this additional production, the company is building plant at Bridgeport, Conn., with 125,000 sq. ft. of floor space to be occupied in June. Although experimental work has been carried on for some time, the first airplane was completed in July, 1928. Officers of the company are: A. C. Dickinson, presi-



PRODUCTION Methods Are Being Adopted by the Fairchild Aviation Corporation at Its New Plant at Farmingdale, Long Island. All structural members of the tail assembly, shown in the illustration, are of stamped metal (Alclad), and stamped sections are also used for the ailerons, wing flaps and fuselage fairing

dent; Igor I. Sikorsky, W. A. Barry, vice-presidents; W. S. Hood, treasurer.

Silverwing Aircraft Corporation, Boulder, Colo. Manufacturer of airplanes.

Simplex Aircraft Corporation, Defiance, Ohio. Built several Red Arrow monoplanes in 1928. Expects to produce about 25 planes in 1929. Officers are: Earl J. Allen, president; F. W. Allen, vice-president; George H. Roberts, secretary-treasurer; O. L. Woodson, designer.

Smith Motors Corporation, P. O. Box 1076, Denver, Colo. Builder of airplane engines.

Southern Aircraft Corporation, Birmingham. Company was organized in July, 1928, and immediately began construction of the first unit of a manufacturing plant; second unit has now been completed, and the two units give capacity for production of five planes a week. Company has plans for the building of other units to increase the capacity to 15 planes a week. Product is a three-place, open cockpit biplane with chrome molybdenum steel used for the fuselage and wing framework. First plane will be completed soon. Officers of the company are: P. R. McCormick, president; Glenn E. Messer, vice-president and general manager; A. R. Pryor, secretary; H. C. Abbott, Jr., office manager.

Spartan Aircraft Co., 902 North Wheeling Street, Tulsa, Okla. Recently built one-story plant, 150 x 300 ft., to be used for airplane assembly and production of parts.

Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn. Recently merged with other companies in North American Aviation, Inc. This company builds anti-aircraft searchlights, sound locaters and similar devices for the United States Government and is carrying on extensive special research in gyroscopic stabilizers for aircraft. Extensive plans for expansion are being considered, but definite decision is delayed until late in January. Officers of the company are Charles S. Doran, president; Thomas A. Morgan, vice-president; W. R. Goodman, treasurer; Herbert H. Thompson, secretary.

Standard Aircraft Mfg. Service, 235 State Street, Detroit. Manufacturer of airplanes.

Standard Steel Propeller Co., 221 Seventh Avenue, West Homestead, Pa. Maker of steel propellers for airplanes. Harry Kraeling is president.

Star Aircraft Co., Bartlesville, Okla. Manufacturer of airplanes. William Parker is president.

Star Compass Co., Dorchester, Mass. Manufactures compasses for airplane use, of which 6000 were produced in 1928, and the 1929 schedule calls for an output of 12,000. The company has plans for the erection of a new plant, twice the size of the present plant. It was organized in 1905. G. A. Sakgeber is owner.

Stearman Aircraft Co., Wichita, Kan. Organized in 1927, company now has plant in operation with rated output of three planes per week. Principal product is relatively high-priced, open cockpit biplane, utilizing Wright 300-hp. motors, but company is also manufacturing cabin biplane known as Stearman Coach, first of which is expected to be in the air early this year. Company is headed by Lloyd Stearman.

Stinson Aircraft Corporation, Northville, Mich. Produced 115 Stinson-Detroiter airplanes in 1928, and its production schedule for 1929 is a minimum of 350 and probable maximum of 500. The company was organized in May, 1926, and its growth has necessitated the building of a new plant adjacent to the Detroit-Wayne industrial airport, Wayne, Mich. The new factory on which work has recently been begun will be of one-story construction, providing about 85,000 sq. ft. floor space. It will be built on a 10-acre site so that it can be doubled or tripled in size with a minimum of disturbance to operations. Completion is scheduled for March 1. Officers of the company are: Edward A. Stinson, president; Henry Hund, vice-president; W. A. Mara, secretary; Richard Fitzgerald, treasurer.

Storms Aviation Co., Spartanburg, S. C. Ten Whizbang monoplanes were produced by this company in 1928, but its 1929 production is uncertain. At present the plant is engaged in converting 40 used motors for airplane use. N. E. Storms is president and L. E. Storms is secretary and treasurer.

Stout Metal Airplane Co., Division of Ford Motor Co., Ford Airport, Dearborn, Mich. Manufacture of Ford all-metal, tri-motored transport planes was placed on mass production basis in 1928 and planes are now being turned out at rate of one every two days, with facilities for stepping speed up to four every five days when demand warrants. Plant consists of two buildings, the first 120 x 500 ft., and the second 120 x 300 ft., both of hangar construction, with the roof supported by cantilever trusses. The Ford transport plane is built in two models, the larger equipped with three Wasp motors, developing 1245 hp., with a wing span of 78 ft. and a cruising speed of 110 miles per hr., which is built to carry 14 passengers and two pilots, and the lighter model, equipped with three 200-hp. Wright Whirlwind motors, which has a wing span of 74 ft. and is built to carry 10 passengers and two pilots.

Swallow Airplane Co., Wichita, Kan. Organized in 1919, company owns plant with buildings especially constructed for aircraft production. Output in 1928 amounted to approximately 200 planes, and with plant extensions now planned capacity will soon be stepped up to 24 planes weekly. The Swallow line consists of a standard commercial plane, an airmail transport plane, especially designed for mail transportation, which was introduced at the Chicago Show, and a low-priced training plane for use of students, to sell at $1,795, exclusive of motor. It is planned to produce 1000 complete planes of the latter type in 1929 and at least 75 of the new air mail transport type. New financing soon to be arranged will bring in $360,000 which will be used for plant and sales expansion. William B. Moore is president of company, and Victor H. Roos, general manager.

Swift Aircraft Corporation, Union National Bank Building, Wichita, Kan. Manufacturer of airplanes.

O. E. Szekely Corporation, Holland, Mich. Builder of a 3-cyl., air-cooled airplane motor and an airplane under the name Flying Dutchman. O. E. Szekely is president.

T

Texas Aero Corporation, Temple, Tex. Manufacturer of airplanes.

Thaden Metal Aircraft Corporation, 50 Hawthorne Street, San Francisco. Organized in 1927, company has built four planes and plans to build six to eight in 1929.

Thomas-Morse Aircraft Corporation, South Tioga Street, Ithaca, N. Y. Formerly built aircraft for the United States Army, but is not now in production, maintaining only an office in Ithaca.

Towle Marine Aircraft Engineering Co., Detroit. Recently engaged in the manufacture of a new type of amphibian.

Travel Air Mfg. Co., Wichita, Kan. Organized in 1925 as manufacturer of several types of cabin and open planes including special de luxe monoplane combining pullman car comfort with air travel. Plant of 55,000 sq. ft. has capacity of about 20 planes per week and 1928 production amounted to approximately 900 units. Large unfilled orders on hand necessitate heavy production this year and plans are being made for construction of addition to factory to take care of increased business. Controlling interest in company was recently acquired by Jackson & Curtis and Hayden, Stone & Co., New York investment bankers. Officers are: Walter H. Beach, president; T. C. Carver, vice-president; J. H. Turner, secretary, and Charles G. Yankey, treasurer.

Turner Aircraft Corporation, Rochester, N. Y. Has plans for one-story airplane factory at Bradford, Pa., including parts and assembly departments. A. W. Legge, Bradford, Pa., is representative.

U

United States Aircraft Co., Spokane, Wash. Manufacturer under license of a British patented airplane under the name Avro.

United States Aircraft Co., New Brunswick, N. J. Recently organized with capital of $125,000 by Condit S. Atkinson, Jr., of Highland Park, N. J., and associates, to produce airplanes. Joseph H. Edgar, 5 Elm Row, New Brunswick, interested in company. No definite word received as to company's production plans.

U. S. Airplane Co., 3670 Milwaukee Avenue, Chicago. Built one demonstrator plane in 1928. Production schedule for 1929 not definite. Has tentative program for plant expansion in 1929. Company organized in 1927. L. B. Combs, president; E. Cooper, vice-president and treasurer.

University Aerial Service Co., P. O. Box 1101, Austin, Tex. Manufacturer of aircraft accessories. S. W. Ruff is president.

V

Velie Motors Corporation, Moline, Ill. Company has recently gone into production on nine-cylinder, radial, air-cooled airplane engine, designed especially for use in four-place airplanes. Plant at Moline has long been used for manufacture of automobiles and a section has been re-tooled for production of this engine. Through its subsidiary, Velie

Monocoupe Aircraft Corporation, also at Moline, company also manufactures commercial airplanes and factory devoted to this use has capacity of six planes daily. Willard L. Velie, Jr., is president.

Verville Aircraft Co., Cabot Avenue, Detroit. Recently organized as an interest of Briggs Commercial & Development Co., which is headed by Walter O. Briggs, president of Briggs Mfg. Co., Detroit, manufacturer of automobile bodies. Verville company will specialize in the manufacture of light planes for commercial service. Former plant of Rickenbacker Motor Co., Cabot Avenue, Detroit, was recently purchased at receivership sale.

W

W. A. S. P. Airplane Co., 1044 Forty-first Street, Oakland, Cal. Manufacturer of airplanes.

Wallace Aircraft Co., 4710 Irving Park Boulevard, Chicago. Built one experimental plane in 1928. Expects to build one plane a week in 1929. Expansion program being considered but not definitely settled. Company organized in 1928. C. E. Thompson, president; O. W. Ford, vice-president; O. E. Carlson, secretary; Archie C. Smith, treasurer.

Warner Aircraft Corporation, Detroit. Produced 94 engines in 1928, but its 1929 schedule calls for a minimum of 500 engines. To provide for the increased production, the company will build a new shop with about 25,000 sq. ft. of floor space. Organized in October, 1926, and its officers are as follows: President, Newton Skillman; vice-president, William O. Warner; secretary, W. J. Jarvie; treasurer, Edward N. Hartwick.

Waterhouse Aircraft Co., P. O. Box 1451, Hollywood, Cal. Manufacturer of airplanes.

Western Airplane Corporation, 53 West Jackson Boulevard, Chicago. Has suspended production until next spring. Company organized in 1924. E. L. Campbell, president; G. P. Campbell, vice-president; C. R. Birkholtz, secretary-treasurer.

Whites' Aircrafts, Seventeenth and Crocker Streets, Des Moines, Iowa. Manufacturer of airplanes.

Wright Aeronautical Corporation, Paterson, N. J. Following expenditure of from $2,000,000 to $3,000,000 on new plant and equipment in the past year, the Wright company plans increase of its output of aircraft motors from 250 to 500 a month. To its previous types, the 225-hp. Whirlwind and 525-hp. Cyclone, will be added the Wright Fury to be produced in three sizes, 150-hp., 5-cyl., 225-hp., 7 cyl. and 300-hp., 9 cyl. To complete its line of aircraft motors from the smallest to the largest, the company recently acquired the American license for manufacture of the Gypsy motor, an aircraft engine of British origin, which will be produced here as the Wright-Gypsy motor of 85 hp. Officers of the company are Charles L. Lawrance, president, Guy W. Vaughan, vice-president and general manager, James F. Prince, secretary-treasurer.

Y

Yackey Aircraft Corporation, Maywood, Ill. Built two planes in 1928, but has suspended production temporarily. Company organized in 1920. Mrs. O. K. Yackey, president; A. E. Hamer, secretary-treasurer.

Z

Zenith Aircraft Co., Wellsville, Ohio. This company was formerly located at Scottdale, Penn., but has recently moved to Wellsville, Ohio. Announcement regarding its plans are withheld by the company for the time being.

Automobile Production in 1928 Breaks All Records

PRODUCTION of cars and trucks in the United States and Canada in 1928 was 4,630,000, according to the National Automobile Chamber of Commerce. Of this total 4,044,000 was passenger vehicles and 586,000 was commercial trucks. With Canadian production estimated at 250,000 units, the net for the United States is 4,380,000.

The 1928 output exceeds by 81,241 the previous high record of 4,298,759 (United States only) in 1926. It is 986,113 units larger than the output in 1927. Other years in which the 1928 total was approached were 1923, with a production of 4,020,255, and 1925, with a total of 4,265,704.

Eighty-five per cent of all passenger vehicles built in the past year were of the closed-body type.

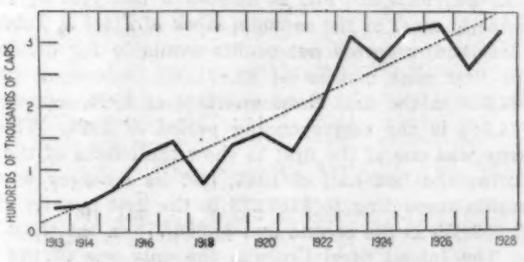
The wholesale value of passenger cars was $2,630,500,000; of trucks, $415,320,000.

The growth of motor bus passenger transportation is shown by the statement that 92,000 buses are now in service, of which 9900 are used as auxiliaries by street railroads and 1250 by steam railroads. Sixty-seven steam railroad companies are employing buses.

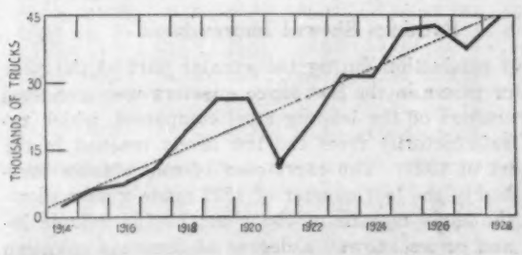
The number of motor vehicles exported in the year was 810,000, valued at $680,600,000, an increase of 27 per cent over the export trade in 1927. Only 520 cars were imported.

The automobile industry in the year used 85 per cent of the rubber produced, 60 per cent of the plate glass, 12 per cent of the copper and 80 per cent of the gasoline.

Registration of motor vehicles in the United States is 24,750,000.



Monthly Average Production of Passenger Automobiles in 1928 Was Substantially Equal to That of 1926. The Dotted Line Is the Long Time Trend.



Monthly Average Production of Motor Trucks, Including Buses, Shows a Record and as Reaching What Would Be Expected According to the Trend Line.

Steel Industry Satisfied if 1929 Maintains 1928 Volume

(Concluded from page 6)

Aside from these two, no other country took as much as 100,000 tons in the first 10 months of 1928. Italy displaces Cuba from third position by taking 85,217 tons, against only 53,508 tons shipped to the Island Republic. Argentina with 82,285 tons and China with 81,851 tons stood in fourth and fifth positions. Brazil took 69,792 tons; Philippines, 71,125; Mexico, 67,494 tons; Venezuela, 64,893 tons; and Chile and Colombia, 56,674 and 54,035 tons respectively.

Rolled steel, including semi-finished, accounted for only 74 per cent of our exports last year, in place of the 83 per cent of the two preceding years. This was due, of course, to the heavy scrap exports in 1928. In imports, rolled steel, including semi-finished, was a little over 58 per cent last year, comparing with 57 per cent in 1927 and only 25 per cent in 1926, when pig iron accounted for 40 per cent of the total.

Belgium had a large lead as the source of imports in the first 10 months with a total of 162,096 tons.

UNITED STATES EXPORTS OF IRON AND STEEL

(Gross Tons)

	1923	1924	1925	1926	1927	1928
Jan.	123,190	247,942	141,777	174,585	215,235	205,766
Feb.	133,902	164,820	102,299	157,187	166,129	185,915
Mar.	163,920	123,618	155,384	169,438	171,094	221,935
Apr.	177,471	131,276	155,375	194,449	192,339	215,184
May	203,389	154,136	150,612	173,418	202,708	267,890
June	171,183	163,770	136,847	159,506	184,364	262,052
July	168,558	137,481	139,861	194,717	190,502	253,336
Aug.	161,426	134,628	188,465	171,588	175,636	287,297
Sept.	172,499	135,979	136,791	182,071	166,352	228,056
Oct.	152,511	157,071	141,817	172,070	170,255	256,870
Nov.	186,956	123,577	171,134	219,830	177,928	.....
Dec.	177,844	128,865	142,209	198,189	168,427	.....
	1,992,849	1,803,163	1,762,571	2,167,048	2,180,969	2,869,000*

*Estimated, as to November and December.

France, in second position, sent 105,120 tons, followed closely by Germany with 99,588 tons. Great Britain sent 81,798 tons; Canada, 64,711 tons; India, 42,937 tons; and Netherlands, 26,010 tons.

HUGE MACHINERY EXPORTS

Machinery exports in the first 10 months of 1928 amounted to $408,403,112. This is the largest figure for the first 10 months since 1920. It compares with $361,284,100 in 1927 and $335,379,213 in 1926. There has been a steadily rising tide of machinery exports since the fall of 1921. Each calendar year has shown a substantial increase, until 1928 represents approximately double the outgoing movement recorded in 1922.

Earnings Showed Improvement

Heavy production during the greater part of the year and better prices in the last three quarters were reflected in the earnings of the leading steel companies, which recovered satisfactorily from the low levels reached in the latter part of 1927. The carry-over of unprofitable business booked in the last quarter of 1927 made a poor showing for the early months of the year; but as volume increased and prices showed a degree of firmness unknown in months, earnings responded. With greater demand came a steadiness in mill operations which made production costs considerably lower than were possible under the fluctuating rates and generally lean schedules of 1927.

The United States Steel Corporation reported earnings of $140,015,494 in the first nine months of 1928, which compares with $132,999,016 in the first three quarters of 1927 and $145,502,216 in the corresponding period of 1926. However, earnings during the third quarter of 1928 were nearly $11,000,000, or 28 per cent, ahead of the September quarter in the previous year and almost equalled those for the third quarter of 1926. The corporation's quarterly earnings in the last three years were as follows, indicating some falling off from the 1926 total:

Quarter	1928	1927	1926
First	$40,934,032	$45,584,725	$45,061,285
Second	46,932,986	46,040,460	47,814,105
Third	52,148,476	41,373,831	52,626,826
Fourth	.....	31,247,529	53,503,525

Net profits of the Bethlehem Steel Corporation in the first nine months of 1928 amounted to $12,186,574, as compared with $13,454,771 in the first three quarters of 1927, and with $15,764,851 in the corresponding period of 1926. Nevertheless, the Bethlehem company's high operating rate during the last quarter of the past year and the more satisfactory prices secured indicate fourth quarter earnings which will make the year's showing quite favorable. During the year the company completed the last of its major plant improvements and its future earnings will show the economies which have been the goal of an extensive program of plant betterment over a five-year period. The quarterly income in recent years has been as follows:

Quarter	1928	1927	1926
First	$3,384,718	$5,618,038	$5,865,850
Second	4,529,328	5,048,680	5,348,023
Third	4,272,528	2,788,053	4,550,978
Fourth	.....	2,371,371	4,481,316

BETTER EARNINGS OF INDEPENDENTS

The Jones & Laughlin Steel Corporation's net income in the first nine months of the past year totaled $11,649,453, a gain of 18 per cent over the corresponding period in 1927 and a decline of about $100,000 from the corresponding total for 1926. The company's profits increased steadily during 1928, amounting to $2,903,457 in the first quarter, $4,241,091 in the second and $4,504,905 in the third.

The net profits of the Youngstown Sheet & Tube Co. increased gradually during the year, amounting to $1,663,516 in the first quarter, $2,491,891 in the second and $2,717,965 in the third, a total of $6,873,372. Although this was somewhat better than the $5,857,070 earned in the first nine months of 1927, it contrasted with the $11,994,092 reported in the corresponding period of 1926. Refinancing during the year will save the company a considerable sum in interest charges.

The Republic Iron & Steel Co., which was enlarged in November, 1927, by the acquisition of the Trumbull Steel Co., Warren, Ohio, and in August of last year by the purchase of most of the common stock of Steel & Tubes, Inc., Cleveland, reported net profits available for dividends in the first nine months of $2,821,962, compared with $2,534,528 in the first three quarters of 1927, and with $3,754,548 in the corresponding period of 1926. This company was one of the first to show the effects of the slump during the last half of 1927, and its recovery was slow, profits amounting to $487,332 in the first quarter of 1928, $1,053,855 in the second and $1,280,775 in the third.

The Inland Steel Co. was the only one of the larger steel producers to report higher profits in the first nine months of 1928 than in the corresponding periods of both 1927 and 1928. Its earnings of $6,931,161 in the three quarters of the past year exceeded the entire year's total for 1927 and were nearly 40 per cent higher than the $5,034,519 earned in the first three quarters of 1926.

Iron and Steel Prices for Sixteen Years

Monthly Averages Computed from the Weekly Market Quotations of THE IRON AGE in the Period of 1913 to 1928

IN this issue of THE IRON AGE are our two colored price charts, in which plotted lines indicate the course of prices for pig iron, billets, scrap and leading forms of finished iron and steel and non-ferrous metals in the 16 years ended with 1928. The diagrams are based on monthly averages of prices quoted week by week in our market reports from the leading selling centers. In the tables following are the monthly average prices of about 80 products, including those on which the charts are based.

Bessemer Pig Iron at Pittsburgh, per Gross Ton (2240 lb.)

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$18.15	$14.96	$14.59	$21.58	$35.95	$37.25	$33.60	$40.00	$33.96	$21.56	$29.27	$24.76	$24.64	$22.76	$21.26	$19.26
February	18.15	15.09	14.55	21.51	35.95	37.25	33.60	42.90	31.46	21.46	29.83	25.26	24.51	22.76	20.76	19.26
March	18.15	15.09	14.55	21.75	37.70	37.25	32.54	43.40	28.16	21.46	32.02	25.14	24.06	22.76	21.16	19.26
April	17.90	14.90	14.55	21.95	42.20	36.15	29.35	43.60	26.96	22.59	32.77	24.56	22.89	21.39	21.26	19.26
May	17.70	14.90	14.59	21.95	45.15	36.15	29.35	44.03	26.16	26.36	31.87	23.89	21.76	21.14	20.96	19.06
June	17.14	14.90	14.70	21.95	54.70	36.38	29.35	44.80	24.71	26.96	30.27	22.89	20.76	20.76	20.64	18.76
July	16.70	14.90	14.95	21.95	57.45	36.60	29.35	47.15	22.84	26.77	28.46	21.96	20.76	20.39	20.26	18.76
August	16.52	14.90	15.95	21.95	54.75	36.60	29.35	49.11	21.96	29.96	28.26	21.76	20.76	19.76	20.16	18.76
September	16.65	14.90	16.85	22.26	48.03	36.60	29.35	50.46	21.96	35.27	28.26	21.76	21.06	20.01	19.76	18.95
October	16.60	14.84	16.95	24.08	37.25	36.60	29.35	49.16	21.96	35.17	26.96	21.76	21.39	20.89	19.76	19.31
November	16.02	14.59	17.51	30.15	37.25	36.60	31.26	41.10	21.96	33.52	25.26	22.13	22.64	21.66	19.76	19.95
December	15.77	14.70	19.65	35.68	37.25	36.60	36.65	36.96	21.96	29.90	24.64	23.66	22.76	21.64	19.39	20.01
Average	*17.12*	*14.89*	*15.78*	*23.90*	*43.64*	*36.67*	*31.09*	*44.39*	*25.34*	*27.58*	*28.68*	*23.29*	*22.33*	*21.33*	*20.46*	*19.22*

Basic Pig Iron, f.o.b. Mahoning or Shenango Valley Furnace, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$16.41	$12.50	$12.50	$17.81	$30.00	$33.00	$30.00	$37.40	$30.00	$18.15	$25.80	$21.25	$22.00	$20.00	$18.00	$17.00
February	16.30	13.19	12.50	17.69	30.00	33.00	30.00	42.25	27.50	17.75	26.25	22.00	22.00	20.00	18.00	17.00
March	16.11	13.00	12.50	18.20	32.25	33.00	28.94	41.50	24.20	17.94	30.13	21.94	21.30	20.00	18.40	17.00
April	15.87	13.00	12.50	18.13	38.75	32.00	25.75	42.40	22.88	20.00	31.05	21.55	20.13	18.63	19.00	17.00
May	15.15	13.00	12.50	18.00	41.60	32.00	25.75	43.25	22.00	24.60	29.00	20.50	18.81	18.38	18.20	16.30
June	14.50	13.00	12.59	18.00	48.75	32.00	25.75	44.00	20.75	25.00	27.38	19.63	18.05	18.00	17.88	15.45
July	14.37	13.00	12.74	18.00	52.50	32.00	25.75	45.85	19.38	24.25	25.10	19.00	18.00	17.63	17.50	16.00
August	14.06	13.00	14.06	18.00	51.20	32.00	25.75	48.10	18.20	26.60	24.75	19.00	18.00	17.50	17.30	16.00
September	14.00	13.00	14.75	18.31	42.75	32.00	25.75	48.50	19.13	32.63	24.88	19.00	18.30	17.50	17.06	16.19
October	13.90	12.81	15.00	19.88	33.00	33.00	25.75	43.75	19.19	30.90	23.50	19.00	18.63	18.00	17.00	17.10
November	13.09	12.48	15.75	25.10	33.00	33.00	28.31	36.50	19.00	27.75	20.88	19.13	19.88	18.50	17.00	17.50
December	12.71	12.50	17.50	30.00	33.00	33.00	34.25	33.00	18.63	24.81	21.00	20.90	20.00	18.50	17.00	17.50
Average	*14.71*	*12.87*	*13.74*	*19.76*	*38.90*	*32.50*	*27.65*	*42.21*	*21.74*	*24.20*	*25.81*	*20.24*	*19.59*	*18.55*	*17.70*	*16.67*

Local No. 2 Foundry Pig Iron at Chicago (at Furnace), per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$17.90	$13.75	$13.00	$18.50	$30.00	$33.00	$31.00	$40.00	$31.50	$18.90	$28.90	$23.70	$24.00	$23.00	$20.88	$18.50
February	17.31	14.00	13.00	18.50	32.00	33.00	31.00	42.25	29.00	19.00	29.75	24.50	24.00	23.00	20.25	18.50
March	17.25	14.25	12.95	18.70	36.00	33.00	29.94	43.00	25.60	20.00	31.25	24.38	23.80	23.00	20.00	18.50
April	17.00	14.25	13.00	19.00	39.25	33.00	26.75	43.00	24.00	20.50	32.00	24.10	22.50	22.00	20.00	18.50
May	16.00	14.06	13.00	19.00	43.80	33.00	26.75	43.00	22.80	22.60	32.00	22.75	21.13	21.63	20.00	18.20
June	15.62	13.69	13.00	19.00	51.00	33.00	26.75	43.40	20.75	23.25	31.25	21.25	20.30	21.10	20.00	18.00
July	14.70	13.75	13.00	19.00	55.00	33.00	26.75	45.25	19.00	24.25	27.90	19.60	20.50	21.00	20.00	17.60
August	15.00	13.69	13.44	18.40	55.00	33.00	26.75	46.00	19.55	28.60	27.00	20.38	20.50	21.00	19.50	17.63
September	15.00	13.25	13.90	18.13	54.67	33.00	26.75	46.00	21.75	32.00	26.75	20.50	21.00	21.00	19.50	18.25
October	15.00	12.94	14.63	19.63	33.00	34.00	27.75	44.50	21.00	31.40	25.00	20.50	21.63	21.00	19.00	18.80
November	14.87	12.56	17.13	25.80	33.00	34.00	31.00	39.40	20.60	29.75	23.13	21.00	22.75	21.00	18.50	20.00
December	14.30	13.00	18.10	29.50	33.00	34.00	38.75	34.50	19.63	28.00	23.00	22.50	23.00	21.00	18.50	20.00
Average	*15.83*	*13.60*	*14.01*	*20.26*	*41.31*	*33.25*	*29.16*	*42.53*	*22.93*	*24.85*	*28.16*	*22.10*	*22.09*	*21.64*	*19.68*	*18.54*

Standard Brands Eastern Pennsylvania No. 2X Foundry Pig Iron at Philadelphia, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$18.25	$14.65	$14.25	$19.94	$30.10	$34.25	$36.15	$44.10	$33.34	$21.34	$29.76	$24.11	$25.01	$24.26	$22.76	$20.56
February	18.25	14.94	14.25	20.00	31.88	34.25	36.15	45.10	31.09	21.09	30.01	24.04	25.01	24.14	22.26	21.14
March	17.77	15.00	14.25	20.05	37.31	34.25	34.39	45.53	27.59	21.26	32.30	24.16	24.21	23.36	22.26	21.26
April	17.40	15.00	14.25	20.50	41.38	34.25	31.90	46.85	26.26	23.62	32.95	23.06	22.82	23.26	22.26	21.26
May	16.75	14.81	14.25	20.50	43.60	34.25	30.70	47.10	25.71	26.09	32.76	22.67	21.51	22.89	22.26	21.26
June	16.19	14.75	14.25	19.94	48.19	34.29	29.50	47.15	25.50	27.06	30.76	21.85	21.26	22.66	22.14	21.26
July	15.60	14.75	14.31	19.75	53.13	34.40	29.08	48.15	23.55	27.92	27.68	21.26	21.26	22.26	21.51	20.86
August	15.60	14.75	14.94	19.55	53.00	34.40	29.60	51.96	20.64	32.26	25.89	21.51	21.57	22.26	21.26	20.76
September	15.83	14.75	16.00	19.50	51.67	34.40	30.70	53.51	21.22	34.83	26.26	21.76	21.96	22.26	20.76	21.01
October	15.95	14.63	16.25	20.31	34.25	38.85	32.10	52.53	22.23	32.54	24.04	21.76	22.64	22.26	20.51	21.26
November	15.56	14.50	17.12	24.90	34.25	39.15	35.35	44.99	22.74	30.39	23.01	22.64	23.64	23.56	20.26	21.64
December	15.20	14.25	19.05	29.25	34.25	39.15	40.10	35.54	21.82	28.86	24.26	24.56	24.26	23.39	20.26	21.76
Average	*16.53*	*14.73*	*15.26*	*21.18*	*41.08*	*35.49*	*32.98*	*46.88*	*25.14*	*27.27*	*28.31*	*22.78*	*22.93*	*23.05*	*21.55*	*21.17*

Southern No. 2 Foundry Pig Iron at Cincinnati, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$16.95	$13.88	$12.40	$17.90	$26.10	$35.90	$34.60	$41.80	$36.75	$20.70	$27.45	$25.55	$24.05	$25.69	$22.19	$19.69
February	16.69	13.81	12.40	17.90	27.53	35.90	34.60	43.60	32.63	20.00	28.68	26.55	24.05	25.69	21.69	19.69
March	16.31	14.00	12.27	17.90	31.90	35.90	33.54	43.60	29.80	19.50	30.80	26.55	24.05	25.69	21.69	19.69
April	15.65	13.75	12.34	17.90	37.40	35.90	30.65	44.00	28.00	20.38	31.05	26.35	24.05	25.69	21.69	19.69
May	14.94	13.75	12.40	17.90	41.90	35.90	29.85	45.60	26.70	22.10	30.75	25.55	24.05	25.69	21.69	19.39
June	14.06	13.63	12.50	17.34	45.15	36.08	28.39	45.60	26.38	23.00	29.30	24.05	23.25	24.59	21.69	19.56
July	13.75	13.30	12.71	16.90	49.90	36.60	28.35	45.60	24.75	22.30	28.85	22.05	22.18	24.19	21.13	19.19
August	14.06	13.25	13.71	16.70	49.90	36.60	30.40	45.78	23.50	24.35	27.68	21.55	22.55	24.19	20.94	19.39
September	14.25	13.25	14.15	17.28	49.90	36.60	31.25	46.50	23.50	29.55	26.55	21.55	22.35	24.07	20.94	19.94
October	14.35	12.90	14.78	18.03	49.38	37.60	31.60	46.50	23.50	30.85	24.68	21.55	23.43	23.69	20.94	19.94
November	13.87	12.90	16.15	22.40	35.90	37.60	34.35	42.50	22.90	27.55	23.65	21.80	24.87	23.69	19.69	20.07
December	13.95	12.50	17.10	25.90	35.90	37.60	38.60	42.50	21.75	26.93	25.05	23.85	25.49	23.69	19.69	20.19
Average	*14.90*	*13.41*	*13.58*	*18.67*	*40.07*	*36.52*	*32.16*	*44.47*	*26.68*	*23.93*	*27.87*	*23.91*	*23.74*	*24.71*	*21.16*	*19.70*

Mahoning and Shenango Valley No. 2 Foundry Iron, at Furnace, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$17.50	$12.85	$13.00	$18.50	$31.00	$33.00	$31.00	$39.40	$31.88	$19.30	$27.00	$22.50	$22.38	$20.50	$18.50	$17.25
February	17.00	13.19	13.00	18.31	32.00	33.00	31.00	41.50	28.00	18.88	27.50	23.00	22.00	20.50	18.50	17.25
March	16.69	13.25	13.00	18.50	34.75	33.00	29.94	41.25	25.90	19.00	30.50	23.00	21.10	20.50	18.50	17.25
April	15.55	13.25	12.75	18.50	39.75	33.00	26.75	42.80	24.75	20.75	31.00	21.80	20.13	19.00	18.50	17.25
May	14.62	13.00	12.94	18.20	42.40	33.00	26.75	44.25	23.50	23.80	30.20	20.75	19.13	18.88	18.50	17.20
June	14.06	13.00	12.69	18.13	50.25	33.00	26.75	45.00	22.10	24.00	27.63	19.63	18.30	17.96	18.13	16.75
July	13.87	13.00	12.70	18.25	54.50	33.00	26.75	45.00	20.13	24.25	25.50	19.00	18.50	17.69	18.00	16.65
August	14.00	13.00	13.62	18.25	53.20	33.00	26.75	47.00	19.63	32.60	24.88	19.13	18.50	17.50	17.60	16.50
September	14.00	13.00	14.70	18.39	47.00	33.00	26.75	49.40	21.00	34.88	24.75	19.80	18.80	17.63	17.50	16.88
October	13.84	12.90	14.87	20.00	33.00	34.00	26.75	46.50	21.00	31.80	23.60	19.50	19.13	18.50	17.50	17.10
November	13.50	12.75	15.50	25.00	33.00	34.00	31.50	40.25	20.75	27.88	21.88	19.50	20.39	19.00	17.45	17.63
December	13.50	12.75	18.30	30.75	33.00	34.00	36.75	36.20	20.00	25.63	22.00	21.20	20.50	18.80	17.25	18.70
Average	*14.84*	*13.00*	*13.92*	*20.07*	*40.32*	*33.25*	*28.95*	*43.21*	*23.22*	*25.23*	*26.37*	*20.73*	*19.90*	*18.87*	*18.00*	*17.20*

Gray Forge Pig Iron, Philadelphia and Vicinity, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$17.65	$14.00	$13.50	$18.44	$28.38	$32.00	$33.90	$40.23	$32.78	$20.60	$27.85	$22.81	$24.00	$23.00	$21.50	$19.65
February	17.31	14.00	13.44	19.00	29.75	32.00	33.90	40.50	30.90	20.50	28.37	22.50	23.63	23.00	21.19	19.75
March	16.87	14.00	13.25	19.00	31.94	32.00	32.84	43.00	26.86	20.50	29.62	22.12	23.40	22.30	21.00	19.75
April	16.56	14.00	13.25	19.13	38.50	32.00	29.65	43.00	25.26	21.25	30.37	22.00	22.63	22.00	21.00	19.75
May	15.81	13.81	13.25	19.50	40.40	32.00	29.21	43.00	25.26	23.80	29.50	22.00	21.50	22.00	21.00	19.75
June	15.37	13.75	13.25	19.25	44.31	32.00	26.25	43.00	24.69	24.25	28.00	22.00	21.50	21.90	21.00	19.75
July	14.95	13.75	13.25	18.50	50.05	32.00	25.92	43.00	22.50	25.50	26.90	21.20	21.50	21.50	21.00	19.75
August	14.62	13.75	14.50	18.50	49.56	32.00	26.60	45.46	21.20	29.00	25.50	21.00	21.00	21.40	20.60	19.75
September	14.56	13.75	15.13	18.50	44.25	32.00	27.00	47.10	20.00	31.00	25.50	21.00	21.00	21.00	20.50	19.75
October	15.00	13.62	15.25	19.35	32.20	36.60	28.69	47.10	20.50	31.00	24.20	21.00	21.25	21.00	20.25	19.75
November	14.75	13.50	16.05	23.75	32.00	36.60	32.40	44.64	22.50	29.14	23.00	21.37	22.00	22.50	19.50	20.00
December	14.58	13.50	17.63	27.69	32.00	36.90	36.10	38.74	21.69	28.14	23.00	23.10	23.00	22.50	19.50	20.50
Average	*15.67*	*13.79*	*14.31*	*20.05*	*37.78*	*33.18*	*30.21*	*43.23*	*24.51*	*25.39*	*26.82*	*21.84*	*22.20*	*22.01*	*20.67*	*19.81*

Malleable Pig Iron at Chicago, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$17.90	$13.88	$13.00	$19.00	$30.94	$33.50	$31.50	$40.50	$32.00	$18.90	$28.90	$23.88	$24.00	$23.00	$20.88	$18.50
February	17.31	13.94	13.00	19.00	31.75	33.50	31.50	42.75	29.38	19.13	29.75	24.50	24.00	23.00	20.25	18.50
March	17.25	14.25	13.00	19.40	35.40	33.50	30.44	43.50	25.80	20.00	31.25	24.38	24.00	23.00	20.00	18.50
April	17.05	14.25	13.00	19.50	39.00	33.50	27.25	43.50	24.00	20.50	32.00	24.10	22.63	22.00	20.00	18.50
May	16.00	14.06	13.00	19.50	43.60	33.50	27.25	43.50	23.00	22.60	32.00	22.75	21.25	21.42	20.00	18.22
June	15.62	13.88	13.00	19.50	50.25	33.50	27.25	43.50	21.50	23.25	31.25	21.25	20.60	21.10	20.00	18.00
July	14.65	14.00	13.00	19.50	55.00	33.50	27.25	45.25	19.00	24.25	27.90	19.60	20.50	21.00	20.00	17.60
August	15.00	14.00	13.44	19.00	55.00	33.50	27.25	46.50	19.60	28.60	27.00	20.38	20.50	21.00	19.50	17.63
September	15.00	13.25	14.30	19.00	54.75	33.50	27.25	46.50	21.75	32.00	26.75	20.50	21.00	21.00	19.50	18.25
October	15.20	13.00	15.25	19.88	33.50	34.50	28.25	45.75	21.00	31.40	25.00	20.50	21.63	21.00	19.00	18.80
November	14.87	12.88	17.13	25.80	33.50	34.50	31.50	39.90	20.60	29.75	23.13	20.88	22.75	21.00	18.50	20.00
December	14.63	12.90	18.20	29.50	33.50	34.50	39.50	35.00	19.63	28.00	23.00	22.62	23.00	21.00	18.50	20.00
Average	*15.87*	*13.69*	*14.11*	*20.72*	*41.35*	*33.75*	*29.68*	*43.01*	*23.11*	*24.87*	*28.16*	*22.11*	*22.15*	*21.63*	*19.68*	*18.54*

Lake Superior Charcoal Pig Iron at Chicago, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$18.15	$15.25	$15.75	$19.50	$31.75	$37.50	$38.85	$48.75	$42.50	$31.10	$33.15	$29.15	$29.04	$29.04	$27.04	$27.04
February	18.00	15.25	15.75	19.75	33.75	37.50	38.85	58.38	39.50	29.38	33.90	29.15	29.04	29.04	27.04	27.04
March	18.00	15.25	15.75	19.75	36.75	37.50	38.85	58.20	38.50	26.00	35.40	29.15	29.04	29.04	27.04	27.04
April	18.00	15.45	15.75	19.75	40.25	37.50	31.75	57.25	38.50	26.50	36.53	29.15	29.04	29.04	27.04	27.04
May	18.00	15.75	15.75	19.75	48.15	37.50	31.75	57.50	37.50	28.40	36.65	29.15	29.04	29.04	27.04	27.04
June	16.81	15.75	15.75	19.75	52.88	37.62	31.75	57.50	37.50	29.75	36.65	29.12	29.04	29.04	27.04	27.04
July	15.65	15.75	15.75	19.75	57.75	38.00	31.75	57.50	36.37	31.65	34.81	29.04	29.04	29.04	27.04	27.04
August	14.69	15.75	16.00	19.75	58.00	38.00	32.25	57.70	33.60	34.05	32.04	29.04	29.04	29.04	27.04	27.04
September	15.25	15.75	15.85	19.75	58.00	38.00	32.75	58.50	33.00	36.15	32.04	29.04	29.04	29.04	27.04	27.04
October	15.25	15.75	15.75	20.25	37.50	38.00	33.44	58.50	31.50	36.15	29.86	29.04	29.04	27.54	27.04	27.04
November	15.25	15.75	17.00	26.46	37.50	38.70	38.50	55.75	31.50	36.15	28.40	29.04	29.04	27.04	27.04	27.04
December	15.25	15.75	18.65	31.75	37.50	38.70	43.00	49.13	31.50	34.65	29.15	29.04	29.04	27.04	27.04	27.04
Average	*16.53*	*15.60*	*16.13*	*21.33*	*44.15*	*37.88*	*35.29*	*56.22*	*35.96*	*31.66*	*33.22*	*29.09*	*29.04*	*28.58*	*27.04*	*27.04*

No. 2 Foundry Pig Iron at Cleveland, (Delivered Consumer) per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$17.87	$13.50	$13.44	$19.30	$31.10	$33.30	$31.40	$40.00	$33.40	$20.06	$27.87	$23.70	$23.87	$22.32	$19.50	$18.50
February	17.53	13.82	13.50	19.23	32.93	33.30	31.40	41.90	30.22	20.06	29.00	24.50	23.99	22.38	19.13	18.50
March	17.16	14.25	13.47	19.05	37.06	33.30	30.58	43.15	27.80	21.55	32.15	24.50	23.47	21.81	19.90	18.50
April	16.39	14.25	13.38	19.36	40.27	33.30	27.15	43.40	26.62	20.81	32.52	24.25	22.82	20.85	19.87	18.50
May	15.62	14.38	13.38	19.45	42.90	33.30	27.15	44.53	25.50	23.75	32.21	23.25	20.87	20.00	19.50	18.50
June	14.96	14.25	13.28	19.07	50.63	33.32	27.15	44.90	24.00	24.06	30.46	21.50	20.12	19.69	19.20	18.39
July	14.69	13.75	13.20	18.79	55.80	33.40	27.15	45.20	21.31	24.75	27.44	20.25	20.00	19.50	19.00	18.00
August	14.68	13.75	14.32	18.76	55.17	33.40	27.40	48.06	20.50	31.31	26.40	20.56	20.00	19.50	19.00	18.00
September	14.75	13.75	15.27	18.92	53.15	33.40	27.65	49.86	20.75	35.94	25.87	20.81	20.00	19.50	19.00	18.39
October	14.83	13.73	15.43	20.12	33.30	34.40	28.15	47.88	20.75	34.09	25.25	21.00	20.55	19.87	18.88	18.63
November	14.40	13.51	16.61	26.20	33.30	34.40	31.90	43.46	20.56	30.47	23.35	21.31	22.32	20.60	18.50	19.50
December	13.78	13.27	18.18	31.13	33.30	34.40	36.90	36.32	19.95	27.25	23.06	22.39	22.26	20.39	18.50	19.50
Average	*15.56*	*13.85*	*14.46*	*20.78*	*41.58*	*33.60*	*29.67*	*44.06*	*24.28*	*26.18*	*27.97*	*22.34*	*21.69*	*20.53*	*19.17*	*18.66*

No. 2 Foundry Pig Iron at Buffalo, (at Furnace) per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$17.43	$12.85	$12.89	$18.75	$34.94	$33.00	$31.00	$40.90	$32.38	$19.44	$26.94	$22.25	$23.00	$21.00	$18.00	$16.45
February	17.06	12.94	13.00	18.53	35.25	33.00	31.00	42.00	30.50	18.87	27.56	22.25	22.75	21.00	17.39	16.50
March	16.70	13.22	12.41	18.72	38.45	33.00	29.94	44.75	29.00	18.30	29.05	21.81	22.12	21.00	17.00	16.39
April	16.22	13.50	12.80	18.88	42.62	33.00	26.75	45.00	26.15	20.81	29.56	21.37	20.65	21.00	17.50	16.00
May	15.18	13.41	12.88	18.78	44.95	33.00	26.75	45.00	25.62	22.62	29.40	20.25	19.00	20.75	17.50	16.00
June	14.32	13.13	12.87	18.65	48.31	33.00	26.75	44.75	23.42	23.05	29.06	19.37	19.00	19.60	17.39	16.00
July	13.83	13.05	12.70	18.70	52.25	33.00	26.63	45.00	20.87	24.50	26.00	19.00	18.85	19.00	16.88	16.00
August	13.98	13.25	13.85	18.63	53.00	33.00	27.77	47.75	19.50	30.70	24.95	19.19	18.72	19.00	16.10	16.13
September	14.09	13.22	14.90	19.00	53.00	33.00	28.25	50.10	20.00	33.94	24.87	19.37	18.75	19.00	16.13	16.63
October	14.00	12.72	15.63	20.37	33.00	34.00	28.70	47.44	20.37	31.12	23.06	19.05	19.40	19.00	16.88	17.10
November	13.69	12.44	16.28	27.25	33.00	34.00	34.30	42.56	19.12	27.80	20.87	20.50	21.19	19.00	17.00	17.81
December	12.87	12.95	18.13	32.75	33.00	34.00	38.25	36.60	19.30	25.50	21.56	22.62	21.50	19.00	17.00	17.60
Average	*14.95*	*13.06*	*14.03*	*20.75*	*41.81*	*33.25*	*29.67*	*44.32*	*23.85*	*24.72*	*26.07*	*20.59*	*20.41*	*19.86*	*17.06*	*16.55*

Southern No. 2 Foundry Pig Iron at Birmingham, Dollars per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$13.56	$10.63	$9.50	$15.00	$23.20	$33.00	$31.00	$38.75	$32.25	$16.20	$23.25	$21.50	$20.00	$22.00	$18.50	$16.00
February	13.38	10.56	9.50	15.00	24.63	33.00	31.00	40.00	28.13	15.00	24.38	22.50	20.00	22.00	18.00	16.00
March	13.06	10.70	9.35	15.00	29.00	33.00	29.44	40.00	25.30	15.00	26.40	22.50	20.00	22.00	18.00	16.00
April	12.40	10.50	9.44	15.00	34.50	33.00	26.75	40.50	23.50	15.38	27.00	22.30	20.00	22.00	18.00	16.00
May	11.69	10.50	9.44	15.00	39.00	33.00	26.75	42.00	22.20	17.60	26.85	21.50	20.00	22.00	18.00	15.70
June	10.81	10.35	9.65	14.50	42.25	33.00	25.25	42.00	21.88	18.38	25.75	20.00	19.60	21.20	18.00	15.88
July	10.50	10.00	9.75	14.00	47.00	33.00	25.15	42.00	20.25	18.25	25.00	18.00	18.00	21.00	17.44	15.50
August	10.81	10.00	10.75	13.80	47.00	33.00	27.38	42.00	19.00	20.10	23.70	17.50	18.00	21.00	17.25	15.69
September	11.00	10.00	11.50	14.38	47.00	33.00	27.95	42.00	19.00	26.00	22.75	17.50	18.50	20.75	17.25	16.25
October	11.25	10.00	12.13	15.50	33.00	34.00	28.00	42.00	19.00	26.80	20.63	17.50	19.38	20.00	17.25	16.25
November	10.63	10.00	13.40	20.13	33.00	34.00	30.75	38.00	18.40	23.50	19.60	17.75	21.00	20.00	16.00	16.39
December	10.70	9.60	14.38	23.00	33.00	33.40	35.20	38.00	17.33	22.88	21.00	19.80	22.00	20.00	16.00	16.50
Average	*11.65*	*10.24*	*10.73*	*15.86*	*36.05*	*33.20*	*28.72*	*40.60*	*22.19*	*19.63*	*23.86*	*19.86*	*19.71*	*21.16*	*17.47*	*16.01*

Bessemer Pig Iron, per Gross Ton, at Valley Furnace

	1922	1923	1924	1925	1926	1927	1928
January	$19.60	$27.50	$23.00	$22.88	$21.00	$19.50	$17.50
February	19.50	28.06	23.50	22.75	21.00	19.00	17.50
March	19.50	30.25	23.38	22.30	21.00	19.40	17.50
April	20.63	31.00	22.80	21.13	19.63	19.50	17.50
May	24.40	30.10	22.13	20.00	19.38	19.20	17.30
June	25.00	28.50	21.13	19.00	19.00	18.88	17.00
July	25.00	26.70	20.20	19.00	18.63	18.50	17.00
August	28.20	26.50	20.00	19.00	18.00	18.40	17.00
September	33.50	26.50	20.00	19.30	18.25	18.00	17.19
October	33.40	25.20	20.00	19.63	19.13	18.00	17.55
November	31.75	23.25	20.38	20.88	19.90	18.00	18.19
December	28.13	22.88	21.90	21.00	19.88	17.56	18.25
Average	*25.63*	*27.20*	*21.53*	*20.57*	*19.57*	*18.66*	*17.46*

Malleable Pig Iron, per Gross Ton, f.o.b. Valley Furnace

	1922	1923	1924	1925	1926	1927	1928
January	$19.50	$27.00	$22.39	$22.39	$20.50	$18.50	$17.30
February	19.00	27.63	23.00	22.00	20.50	18.50	17.25
March	19.00	30.50	22.50	21.50	20.50	18.50	17.25
April	19.50	31.00	22.10	20.63	19.00	18.50	17.25
May	24.20	30.20	21.00	19.25	18.88	18.50	17.25
June	24.50	28.13	19.88	18.50	18.05	18.13	17.00
July	25.13	25.40	19.00	18.50	17.75	18.00	17.00
August	29.50	24.50	19.13	18.50	17.50	17.60	17.00
September	33.50	24.50	19.80	18.80	17.63	17.50	17.19
October	32.70	23.30	19.50	19.13	18.50	17.50	17.55
November	29.00	20.88	19.75	20.38	19.00	17.50	18.19
December	26.25	20.00	21.20	20.50	18.75	17.50	18.19
Average	*25.15*	*26.09*	*20.77*	*20.01*	*18.88*	*18.02*	*17.37*

Gray Forge Pig Iron, per Gross Ton, f.o.b. Valley Furnace

	1922	1923	1924	1925	1926	1927	1928
January	$19.00	$26.50	$22.00	$21.88	$20.00	$18.00	$16.75
February	18.81	27.00	22.00	21.50	20.00	18.00	16.75
March	18.75	30.00	22.00	20.60	20.00	18.00	16.75
April	20.44	30.50	21.40	19.63	18.50	18.00	16.75
May	23.30	29.70	20.25	18.63	18.38	18.00	16.70
June	23.50	26.63	19.13	17.80	17.45	17.63	16.25
July	23.75	25.00	18.50	18.00	17.20	17.50	16.25
August	29.45	24.00	18.63	18.00	17.00	17.10	16.25
September	34.13	24.00	19.30	18.30	17.13	17.00	16.44
October	31.10	23.30	19.00	18.63	18.00	17.00	16.60
November	27.63	21.39	19.00	19.38	18.50	16.95	17.13
December	25.25	21.50	20.70	20.00	18.25	16.75	17.20
Average	*24.59*	*25.79*	*20.16*	*19.39*	*18.39*	*17.33*	*16.65*

Basic Pig Iron, per Gross Ton, Delivered Eastern Pennsylvania

	1922	1923	1924	1925	1926	1927	1928
January	$20.13	$27.80	$23.00	$24.25	$23.00	$21.50	$19.50
February	19.84	28.19	22.69	23.88	23.00	21.19	19.50
March	22.61	29.56	21.81	23.55	22.10	20.85	19.50
April	21.00	30.81	21.50	22.31	21.75	20.75	19.50
May	24.00	30.60	21.00	21.13	21.75	20.75	19.10
June	25.00	28.14	21.00	21.50	21.45	20.75	19.00
July	25.75	26.60	20.20	21.50	21.00	20.75	18.95
August	27.23	25.00	20.00	20.50	20.95	20.15	18.75
September	30.33	25.00	20.00	20.70	20.75	20.00	18.88
October	29.30	24.20	20.00	21.25	20.69	20.00	19.45
November	27.33	22.88	21.13	22.39	22.60	19.60	19.75
December	27.31	23.13	23.41	23.00	22.00	19.25	20.05
Average	*25.08*	*26.83*	*21.31*	*22.16*	*21.75*	*20.46*	*19.33*

Virginia No. 2X Foundry Pig Iron, Delivered Eastern Pennsylvania (Per Gross Ton)

	1922	1923	1924	1925	1926	1927	1928
January	$27.84	$32.97	$30.17	$29.67	$28.17	$27.67	$24.54
February	27.61	33.17	30.52	29.67	28.17	26.67	24.54
March	27.24	33.79	30.67	29.67	28.17	26.67	24.54
April	27.74	34.67	30.67	29.67	28.17	27.17	24.54
May	28.24	35.07	30.67	29.17	28.17	27.17	24.54
June	28.24	33.17	30.67	29.17	28.17	27.17	24.54
July	30.17	32.27	29.87	29.17	28.17	27.17	24.54
August	30.17	31.42	28.67	29.17	28.17	26.67	24.41
September	36.17	30.92	28.67	28.77	28.17	25.98	24.54
October	38.17	30.17	28.67	28.17	28.17	25.79	24.54
November	37.17	30.17	28.67	28.17	28.17	25.79	24.60
December	33.92	30.17	29.27	28.17	28.17	25.79	25.29
Average	*31.06*	*32.33*	*29.77*	*29.05*	*28.17*	*26.64*	*24.60*

Standard Low-Phosphorus Pig Iron at Furnace in New York State (Per Gross Ton)

	1922	1923	1924	1925	1926	1927	1928
January	$30.00	$35.00	$27.10	$25.50	$23.25	$24.50	$23.00
February	30.00	35.00	27.00	25.50	23.00	25.00	23.00
March	30.00	35.00	27.00	25.10	22.50	25.00	23.00
April	30.00	35.00	25.80	24.75	22.38	25.00	23.00
May	30.00	33.20	24.75	24.00	22.00	25.00	22.00
June	30.00	30.50	24.75	23.00	22.00	25.00	22.00
July	30.00	29.00	24.00	22.00	22.00	25.00	22.00
August	33.00	29.00	24.00	22.00	22.00	25.00	22.00
September	38.00	28.50	24.00	22.00	22.00	23.00	22.00
October	38.00	28.00	23.75	22.00	22.88	23.00	22.00
November	38.00	27.88	23.88	24.00	24.10	23.00	22.00
December	35.00	27.50	25.30	24.00	24.00	23.00	22.00
Average	*32.67*	*31.13*	*25.11*	*23.65*	*22.68*	*24.29*	*22.33*

THE IRON AGE Composite Iron and Steel Prices

Composite Pig Iron Price

Average of THE IRON AGE quotations on basic pig iron at Valley furnace and foundry iron at Chicago, Birmingham, Buffalo, Valley and Philadelphia. Quoted in dollars per gross ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$16.49	$12.76	$12.38	$17.81	$28.88	$33.21	$31.36	$39.08	$31.18	$18.48	$26.78	$22.15	$22.44	$21.79	$19.44	$17.63
February	16.31	13.18	12.38	17.76	29.75	33.21	31.36	42.35	28.45	18.14	27.20	22.84	22.50	21.77	19.07	17.73
March	16.07	13.16	12.34	18.06	32.18	33.21	30.10	42.17	25.18	18.35	30.11	22.81	21.99	21.65	19.03	17.73
April	15.74	13.13	12.37	18.15	38.56	32.71	27.11	42.93	23.73	20.00	30.83	22.31	20.95	20.96	19.21	17.67
May	14.98	13.06	12.37	18.08	41.87	32.71	26.91	43.64	22.78	23.35	29.74	21.40	19.85	20.69	19.09	17.45
June	14.35	12.97	12.45	17.91	47.95	32.71	26.46	44.09	21.73	23.95	28.23	20.27	19.22	20.00	18.92	17.23
July	13.99	12.92	12.55	17.79	52.11	32.73	26.37	45.44	20.22	23.86	25.96	19.31	18.96	19.51	18.56	17.10
August	13.93	12.91	13.55	17.63	51.43	32.73	26.83	47.38	18.97	26.69	25.19	19.40	19.01	19.46	18.17	17.11
September	13.97	12.83	14.28	17.82	46.93	32.73	27.11	47.83	19.89	31.78	25.02	19.46	19.39	19.46	18.03	17.54
October	13.93	12.67	14.67	19.18	33.21	34.31	27.52	45.05	19.97	30.57	23.30	19.46	19.92	19.69	17.96	17.94
November	13.39	12.42	15.82	24.36	33.21	34.36	30.34	38.65	19.79	27.82	21.40	19.79	21.16	20.13	17.59	18.46
December	13.06	12.39	17.34	28.63	33.21	34.26	36.13	34.51	19.11	25.70	21.88	21.60	21.54	19.94	17.55	18.51
Average	*14.68*	*12.87*	*13.54*	*19.43*	*36.11*	*33.24*	*28.97*	*42.76*	*22.58*	*24.06*	*26.30*	*20.90*	*20.58*	*20.42*	*18.55*	*17.68*

Composite Price of Finished Steel

Average of THE IRON AGE quotations on steel bars, beams, tank plates, plain wire, open-hearth rails, black pipe and black sheets. Quoted in cents a pound

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	1.771	1.451	1.383	2.06	3.384	3.549	3.371	3.158	3.057	2.059	2.469	2.783	2.560	2.447	2.432	2.318
February	1.766	1.477	1.395	2.203	3.501	3.549	3.371	3.486	2.918	2.007	2.605	2.782	2.546	2.428	2.378	2.361
March	1.786	1.473	1.413	2.447	3.739	3.549	3.282	3.743	2.764	2.014	2.721	2.746	2.537	2.433	2.367	2.362
April	1.79	1.446	1.437	2.611	4.110	3.549	3.031	3.842	2.737	2.075	2.814	2.692	2.503	2.439	2.360	2.359
May	1.727	1.424	1.433	2.75	4.562	3.549	3.021	3.804	2.764	2.113	2.793	2.639	2.460	2.416	2.360	2.350
June	1.687	1.399	1.444	2.689	5.004	3.549	3.021	3.756	2.643	2.148	2.789	2.610	2.440	2.420	2.369	2.341
July	1.667	1.40	1.471	2.64	5.334	3.549	3.021	3.885	2.455	2.169	2.783	2.563	2.435	2.431	2.367	2.325
August	1.624	1.446	1.511	2.682	5.249	3.549	3.021	3.967	2.341	2.292	2.775	2.515	2.413	2.431	2.367	2.348
September	1.591	1.47	1.559	2.765	5.049	3.549	3.004	3.956	2.248	2.419	2.775	2.487	2.397	2.439	2.356	2.348
October	1.559	1.446	1.634	2.856	3.470	3.55	3.052	3.81	2.218	2.461	2.775	2.464	2.405	2.449	2.319	2.363
November	1.505	1.397	1.769	3.021	3.444	3.549	3.034	3.566	2.129	2.445	2.775	2.481	2.433	2.453	2.299	2.367
December	1.463	1.366	1.941	3.278	3.441	3.461	3.11	3.114	2.107	2.439	2.775	2.540	2.450	2.453	2.310	2.385
Average	*1.663*	*1.434*	*1.534*	*2.671*	*4.188*	*3.542*	*3.115*	*3.675*	*2.532*	*2.220*	*2.738*	*2.609*	*2.465*	*2.439*	*2.357*	*2.352*

Billets and Finished Steel

Bessemer Steel Billets at Pittsburgh, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$28.30	$20.13	$19.25	$32.00	$63.00	$47.50	$43.50	$48.00	$43.50	$28.00	$37.30	$40.00	$37.00	$35.00	$35.00	$33.00
February	28.50	21.00	19.50	33.50	65.00	47.50	43.50	55.25	42.25	28.00	39.63	40.00	37.00	35.00	33.00	33.00
March	28.50	21.00	19.70	42.40	66.25	47.50	42.25	60.00	38.40	28.00	44.38	40.00	36.70	35.00	34.00	33.00
April	28.50	20.80	20.00	45.00	73.75	47.50	38.50	60.00	37.50	29.50	45.00	40.00	35.50	35.00	33.25	33.00
May	27.37	20.00	20.00	45.00	86.00	47.50	38.50	60.00	37.00	34.00	44.60	38.50	35.25	35.00	33.00	33.00
June	26.50	19.50	20.50	43.50	98.75	47.50	38.50	61.00	37.00	35.00	42.63	38.00	35.00	35.00	33.00	32.25
July	26.60	19.00	21.38	41.00	100.00	47.50	38.50	62.50	32.25	35.00	42.50	38.00	35.00	35.00	33.00	32.00
August	26.00	20.25	23.13	44.20	86.00	47.50	38.50	61.00	29.60	36.10	42.50	37.75	35.00	35.00	33.00	32.00
September	24.87	21.00	24.10	45.00	66.25	47.50	38.50	58.74	29.00	39.50	41.88	36.40	35.00	35.00	33.00	32.00
October	23.30	20.00	24.63	46.25	49.38	47.50	38.50	55.00	29.00	40.00	40.00	35.75	34.25	35.00	33.00	32.80
November	21.00	19.25	26.50	52.00	47.50	47.50	41.38	49.70	29.00	37.75	40.00	35.50	34.75	35.00	33.00	33.00
December	20.00	19.00	30.60	57.50	47.50	45.50	46.00	43.50	29.00	36.50	40.00	36.00	35.00	35.00	33.00	33.00
Average	*25.79*	*20.08*	*22.44*	*43.95*	*70.78*	*47.33*	*40.51*	*56.22*	*34.46*	*33.95*	*41.70*	*37.99*	*35.23*	*35.00*	*33.27*	*32.67*

Open-Hearth Steel Billets at Pittsburgh, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$28.90	$20.25	$19.25	$33.00	$63.00	$47.50	$43.50	$48.00	$43.50	$28.00	$37.50	$40.00	$38.00	$35.00	$35.00	$33.00
February	29.00	21.00	19.50	34.75	65.00	47.50	43.50	55.25	41.00	28.00	39.63	40.00	38.00	35.00	33.00	33.00
March	29.00	21.00	19.70	42.60	66.25	47.50	42.25	60.00	38.50	28.00	44.39	40.00	36.70	35.00	34.00	33.00
April	29.00	20.80	20.00	45.00	73.75	47.50	38.50	60.00	37.50	29.50	45.00	40.00	35.50	35.00	33.25	33.00
May	27.63	20.00	20.00	43.40	86.00	47.50	38.50	60.00	37.00	34.00	45.00	38.50	35.25	35.00	33.00	33.00
June	26.50	19.40	20.50	41.50	98.75	47.50	38.50	61.00	37.00	35.00	42.63	38.00	35.00	35.00	33.00	32.25
July	26.60	19.00	21.88	42.75	100.00	47.50	38.50	65.00	32.25	35.00	42.50	38.00	35.00	35.00	33.00	32.00
August	25.39	20.25	23.50	45.00	82.50	47.50	38.50	61.00	29.60	35.50	42.50	37.75	35.00	35.00	33.00	32.00
September	24.13	21.00	24.60	45.00	66.25	47.50	38.50	58.75	29.00	39.50	41.88	36.40	35.00	35.00	33.00	32.00
October	23.30	20.00	25.25	46.25	50.50	47.50	38.50	55.00	29.00	40.00	40.00	35.75	34.25	35.00	33.00	32.80
November	21.00	19.25	27.25	52.00	47.50	47.50	41.39	49.70	29.00	37.75	40.00	35.50	34.75	35.00	33.00	33.00
December	20.00	19.00	31.80	57.50	47.50	45.50	46.40	43.50	29.00	36.50	44.00	36.00	35.00	35.00	33.00	33.00
Average	*25.87*	*20.08*	*22.77*	*44.06*	*70.58*	*47.33*	*40.54*	*56.43*	*34.36*	*33.90*	*41.75*	*37.99*	*35.62*	*35.00*	*33.27*	*32.67*

Wire Rods at Pittsburgh

No. 5 Bessemer wire rods, per gross ton. The quotations for November and December, 1917, and all of 1918, are Government prices and apply also to open-hearth rods

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$30.00	$25.50	$25.00	$43.00	$75.00	$57.00	$57.00	$60.00	$57.00	$36.00	$47.00	$51.00	$48.00	$45.00	$45.00	$41.60
February	30.00	26.38	25.00	48.00	77.50	57.00	57.00	63.75	54.50	35.75	49.38	51.00	48.00	45.00	43.00	43.00
March	30.00	26.50	25.00	54.80	81.00	57.00	55.75	70.00	52.00	36.00	50.00	51.00	48.00	45.00	43.00	44.00
April	30.00	26.00	25.00	60.00	85.00	57.00	52.00	70.00	49.00	38.00	50.25	51.00	47.00	45.00	42.25	44.00
May	30.00	25.50	25.00	60.00	86.00	57.00	52.00	72.50	48.00	38.00	51.00	48.75	46.00	45.00	42.00	44.00
June	29.50	24.50	25.00	53.75	92.50	57.00	52.00	75.00	48.00	38.50	51.00	48.00	45.60	45.00	42.00	42.00
July	28.30	24.50	25.63	53.75	96.25	57.00	52.00	75.00	43.00	40.00	51.00	48.00	45.00	45.00	42.25	42.00
August	28.00	25.00	27.00	55.00	94.00	57.00	52.00	75.00	41.80	42.40	51.00	46.50	45.00	45.00	43.00	42.00
September	27.37	26.20	29.40	55.00	88.75	57.00	52.00	75.00	39.50	46.25	51.00	46.00	45.00	45.00	43.00	42.00
October	26.60	25.88	31.75	55.00	77.25	57.00	52.00	75.00	40.50	45.00	51.00	45.50	45.00	45.00	42.75	42.00
November	25.87	25.25	36.25	63.00	57.00	57.00	54.50	66.40	40.00	45.00	51.00	45.00	45.00	45.00	41.00	42.00
December	25.17	25.00	39.50	68.75	57.00	57.00	59.50	57.00	38.00	45.00	51.00	48.00	45.00	45.00	40.00	42.00
Average	*28.40*	*25.52*	*28.29*	*55.84*	*79.77*	*57.00*	*53.98*	*69.55*	*45.94*	*40.49*	*50.39*	*48.31*	*46.05*	*45.00*	*42.44*	*42.55*

Plain Wire, Base, at Pittsburgh, Cents a Pound

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	1.51	1.37	1.55	1.35	1.34	1.98	2.95	3.25	3.25	3.25	3.25	2.25	2.45	2.75	2.60	2.50	2.49	2.40
February	1.55	1.40	1.55	1.40	1.39	2.10	2.95	3.25	3.25	3.50	3.13	2.20	2.63	2.75	2.60	2.50	2.41	2.48
March	1.57	1.40	1.56	1.40	1.40	2.25	3.11	3.25	3.19	3.50	3.00	2.25	2.65	2.75	2.60	2.50	2.40	2.50
April	1.60	1.40	1.60	1.40	1.37	2.25	3.23	3.25	3.00	3.50	3.00	2.25	2.68	2.75	2.50	2.50	2.40	2.50
May	1.60	1.40	1.60	1.36	1.35	2.45	3.45	3.25	3.00	3.50	3.00	2.25	2.75	2.68	2.50	2.50	2.40	2.50
June	1.55	1.40	1.60	1.30	1.35	2.45	3.70	3.25	3.00	3.50	2.75	2.25	2.75	2.65	2.49	2.50	2.40	2.50
July	1.50	1.42	1.58	1.32	1.39	2.45	3.95	3.25	3.00	3.50	2.56	2.25	2.75	2.63	2.50	2.50	2.40	2.42
August	1.50	1.46	1.48	1.36	1.43	2.53	3.95	3.25	3.00	3.69	2.50	2.29	2.75	2.56	2.50	2.50	2.40	2.40
September	1.46	1.50	1.47	1.40	1.54	2.55	3.95	3.25	3.00	3.75	2.58	2.39	2.75	2.53	2.50	2.50	2.40	2.40
October	1.44	1.50	1.41	1.40	1.65	2.60	3.25	3.25	3.17	3.75	2.60	2.45	2.75	2.50	2.50	2.50	2.40	2.40
November	1.37	1.50	1.39	1.39	1.72	2.80	3.25	3.25	3.29	3.65	2.56	2.45	2.75	2.50	2.50	2.50	2.40	2.40
December	1.34	1.53	1.35	1.31	1.89	2.95	3.25	3.25	3.21	3.25	2.44	2.45	2.75	2.60	2.50	2.50	2.40	2.48
Average	*1.50*	*1.44*	*1.51*	*1.37*	*1.48*	*2.47*	*3.43*	*3.25*	*3.11*	*3.53*	*2.78*	*2.31*	*2.70*	*2.64*	*2.52*	*2.50*	*2.41*	*2.45*

Wire Nails at Pittsburgh, Dollars a Keg of 100 Lb.

	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$1.95	$1.85	$1.71	$1.57	$1.75	$1.54	$1.54	$2.13	$3.00	$3.50	$3.50	$4.50	$3.25	$2.50	$2.70	$3.00	$2.85	$2.65	$2.64	$2.54
February	1.95	1.85	1.75	1.60	1.75	1.60	1.57	2.25	3.00	3.50	3.50	4.50	3.21	2.40	2.78	3.00	2.85	2.65	2.56	2.62
March	1.95	1.85	1.79	1.60	1.76	1.60	1.60	2.40	3.20	3.50	3.44	4.00	3.02	2.40	2.83	3.00	2.85	2.65	2.55	2.65
April	1.87	1.85	1.80	1.60	1.80	1.60	1.56	2.40	3.28	3.50	3.25	4.00	3.13	2.40	2.93	3.00	2.80	2.65	2.55	2.65
May	1.65	1.82	1.80	1.60	1.80	1.56	1.55	2.50	3.50	3.50	3.25	4.00	3.05	2.40	3.00	2.93	2.75	2.65	2.50	2.55
June	1.70	1.80	1.75	1.60	1.80	1.50	1.55	2.50	3.75	3.50	3.25	4.00	3.00	2.40	3.00	2.90	2.68	2.65	2.50	2.55
July	1.72	1.75	1.70	1.62	1.70	1.52	1.60	2.50	4.00	3.50	3.25	4.00	2.81	2.40	3.00	2.88	2.65	2.65	2.53	2.55
August	1.80	1.70	1.69	1.66	1.65	1.56	1.61	2.58	4.00	3.50	3.25	4.25	2.75	2.48	3.00	2.81	2.65	2.65	2.55	2.55
September	1.80	1.70	1.65	1.70	1.65	1.60	1.69	2.60	4.00	3.50	3.25	4.25	2.86	2.63	3.00	2.78	2.65	2.65	2.55	2.55
Octpber	1.80	1.70	1.64	1.70	1.63	1.60	1.80	2.63	...	3.50	3.31	4.25	2.90	2.70	3.00	2.75	2.63	2.65	2.54	2.55
November	1.80	1.70	1.55	1.70	1.59	1.50	1.87	2.85	3.50	3.50	3.50	4.05	2.84	2.70	3.00	2.75	2.65	2.65	2.50	2.55
December	1.85	1.70	1.53	1.72	1.55	1.51	2.04	3.00	3.50	3.50	4.12	3.25	2.69	2.70	3.00	2.85	2.65	2.65	2.50	2.55
Average	*1.82*	*1.77*	*1.70*	*1.64*	*1.70*	*1.56*	*1.67*	*2.53*	*3.52*	*3.50*	*3.41*	*4.09*	*2.96*	*2.51*	*2.94*	*2.89*	*2.72*	*2.65*	*2.54*	*2.57*

Steel Rails at Mill, Open-Hearth, Dollars per Gross Ton

The extra $2 a gross ton, which was for many years charged for open-hearth rails, was annulled with the rail price announced Oct. 22, 1921

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$30.00	$30.00	$30.00	$30.00	$40.00	$57.00	$57.00	$47.00	$47.00	$40.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00
February	30.00	30.00	30.00	30.00	40.00	57.00	57.00	47.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00
March	30.00	30.00	30.00	30.00	40.00	57.00	54.50	49.50	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00
April	30.00	30.00	30.00	30.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00
May	30.00	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00
June	30.00	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00
July	30.00	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00
August	30.00	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00
September	30.00	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00
October	30.00	30.00	30.00	35.00	....	57.00	47.00	57.00	45.25	43.00	43.00	43.00	43.00	43.00	43.00	43.00
November	30.00	30.00	30.00	38.00	....	57.00	47.00	57.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
December	30.00	30.00	30.00	40.00	....	57.00	47.00	53.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Average	*30.00*	*30.00*	*30.00*	*34.00*	*40.00*	*57.00*	*49.29*	*54.38*	*45.69*	*40.75*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*

Soft Steel Bars at Pittsburgh, Cents a Pound

	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	1.40	1.50	1.40	1.15	1.70	1.20	1.10	2.03	3.15	2.90	2.70	2.75	2.35	1.50	2.04	2.40	2.10	2.00	1.98	1.81
February	1.35	1.50	1.40	1.12	1.70	1.20	1.10	2.31	3.25	2.90	2.70	3.00	2.15	1.39	2.20	2.40	2.10	2.00	1.90	1.85
March	1.20	1.45	1.40	1.10	1.85	1.20	1.15	2.65	3.63	2.90	2.61	3.63	2.00	1.39	2.39	2.40	2.10	2.00	1.90	1.85
April	1.15	1.45	1.40	1.16	1.84	1.15	1.20	2.88	3.75	2.90	2.35	3.75	2.05	1.50	2.50	2.29	2.05	2.00	1.89	1.85
May	1.19	1.45	1.37	1.20	1.70	1.14	1.20	3.00	4.00	2.90	2.35	3.63	2.10	1.58	2.40	2.24	2.00	1.95	1.85	1.85
June	1.20	1.45	1.25	1.20	1.60	1.11	1.21	2.75	4.25	2.90	2.35	3.50	2.05	1.70	2.40	2.20	2.00	2.00	1.81	1.85
July	1.27	1.45	1.23	1.25	1.50	1.12	1.25	2.63	4.50	2.90	2.35	3.50	1.84	1.70	2.40	2.15	2.00	2.00	1.80	1.85
August	1.32	1.40	1.20	1.30	1.40	1.19	1.30	2.56	4.30	2.90	2.35	3.25	1.74	1.88	2.40	2.13	1.95	2.00	1.80	1.90
September	1.39	1.40	1.19	1.37	1.40	1.20	1.34	2.60	4.00	2.90	2.35	3.25	1.63	2.00	2.40	2.04	1.92	2.00	1.78	1.90
October	1.51	1.40	1.12	1.45	1.39	1.15	1.44	2.75	2.90	2.90	2.39	3.13	1.55	2.00	2.40	2.00	2.00	2.00	1.75	1.91
November	1.50	1.40	1.08	1.55	1.29	1.10	1.62	2.83	2.90	2.90	2.69	2.87	1.50	2.00	2.40	2.03	2.00	2.00	1.77	1.94
December	1.50	1.40	1.12	1.66	1.21	1.07	1.84	3.00	2.90	2.80	2.75	2.35	1.50	2.00	2.40	2.10	2.00	2.00	1.80	1.90
Average	*1.33*	*1.44*	*1.26*	*1.29*	*1.55*	*1.15*	*1.31*	*2.67*	*3.63*	*2.89*	*2.50*	*3.22*	*1.87*	*1.72*	*2.36*	*2.20*	*2.02*	*2.00*	*1.84*	*1.87*

Tank Plates at Pittsburgh, Cents a Pound

	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	1.60	1.55	1.40	1.15	1.75	1.20	1.10	2.25	4.45	3.25	3.00	2.72	2.65	1.48	2.06	2.50	2.00	1.86	1.90	1.81
February	1.52	1.55	1.40	1.11	1.71	1.20	1.10	2.56	4.88	3.25	3.00	3.50	2.33	1.39	2.23	2.45	2.00	1.80	1.86	1.85
March	1.30	1.55	1.40	1.12	1.70	1.18	1.10	3.10	5.25	3.25	2.91	3.63	2.04	1.39	2.39	2.39	2.00	1.86	1.85	1.85
April	1.27	1.55	1.40	1.21	1.68	1.15	1.15	3.56	5.88	3.25	2.65	3.75	2.10	1.48	2.50	2.28	2.00	1.90	1.85	1.85
May	1.29	1.51	1.39	1.25	1.60	1.12	1.15	3.75	6.60	3.25	2.65	3.75	2.20	1.56	2.50	2.20	2.00	1.86	1.84	1.85
June	1.25	1.48	1.35	1.25	1.45	1.10	1.16	3.63	8.00	3.25	2.65	3.55	1.95	1.63	2.50	2.18	1.92	1.88	1.80	1.85
July	1.33	1.41	1.35	1.30	1.45	1.10	1.22	3.44	9.00	3.25	2.65	3.38	1.85	1.70	2.50	2.09	1.90	1.90	1.80	1.85
August	1.40	1.40	1.34	1.35	1.44	1.18	1.26	3.70	8.80	3.25	2.65	3.25	1.78	1.88	2.50	1.95	1.85	1.90	1.80	1.90
September	1.46	1.40	1.29	1.47	1.40	1.20	1.34	4.00	8.00	3.25	2.53	3.25	1.64	2.13	2.50	1.82	1.80	1.90	1.78	1.90
October	1.50	1.40	1.17	1.53	1.36	1.14	1.44	4.00	3.25	3.25	2.61	3.09	1.60	2.11	2.50	1.80	1.80	1.90	1.75	1.90
November	1.54	1.40	1.13	1.59	1.26	1.08	1.65	4.15	3.25	3.25	2.65	2.81	1.54	1.99	2.50	1.83	1.86	1.90	1.77	1.90
December	1.55	1.40	1.15	1.60	1.20	1.05	2.04	4.25	3.25	3.13	2.65	2.65	1.50	1.95	2.50	1.92	1.90	1.90	1.80	1.90
Average	*1.42*	*1.47*	*1.31*	*1.33*	*1.50*	*1.14*	*1.31*	*3.53*	*5.88*	*3.24*	*2.72*	*3.28*	*1.93*	*1.72*	*2.43*	*2.12*	*1.91*	*1.88*	*1.82*	*1.87*

Structural Shapes at Pittsburgh, Cents a Pound

	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	1.60	1.55	1.40	1.15	1.75	1.20	1.10	1.90	3.25	3.00	2.80	2.47	2.45	1.50	2.06	2.50	2.10	1.90	1.98	1.81
February	1.52	1.51	1.40	1.11	1.71	1.20	1.10	2.06	3.25	3.00	2.80	2.70	2.26	1.39	2.20	2.50	2.10	1.90	1.90	1.85
March	1.30	1.50	1.40	1.15	1.70	1.19	1.10	2.40	3.54	3.00	2.71	3.13	2.08	1.39	2.39	2.39	2.10	1.90	1.90	1.85
April	1.27	1.50	1.40	1.21	1.68	1.15	1.20	2.55	3.88	3.00	2.45	3.25	2.10	1.50	2.50	2.29	2.05	1.90	1.88	1.85
May	1.27	1.50	1.39	1.25	1.50	1.14	1.20	2.60	4.00	3.00	2.45	3.10	2.20	1.56	2.50	2.24	2.00	1.90	1.80	1.85
June	1.25	1.48	1.35	1.25	1.45	1.11	1.20	2.53	4.31	3.00	2.45	3.10	2.10	1.63	2.50	2.20	2.00	1.94	1.80	1.85
July	1.33	1.41	1.35	1.30	1.45	1.12	1.25	2.50	4.50	3.00	2.45	3.10	1.93	1.70	2.50	2.09	2.00	2.00	1.80	1.85
August	1.40	1.40	1.35	1.35	1.45	1.19	1.30	2.52	4.30	3.00	2.45	3.10	1.82	1.88	2.50	2.00	1.95	2.00	1.80	1.90
September	1.46	1.40	1.34	1.42	1.41	1.20	1.35	2.64	4.00	3.00	2.45	3.10	1.64	2.00	2.50	2.00	1.90	2.00	1.78	1.90
October	1.50	1.40	1.21	1.48	1.37	1.15	1.44	2.75	3.00	3.00	2.45	3.05	1.60	2.00	2.50	1.93	1.90	2.00	1.75	1.90
November	1.54	1.40	1.13	1.57	1.29	1.10	1.60	2.86	3.00	3.00	2.45	2.89	1.54	2.00	2.50	2.00	1.90	2.00	1.77	1.90
December	1.55	1.40	1.15	1.60	1.25	1.07	1.78	3.25	3.00	2.90	2.45	2.45	1.50	2.00	2.50	2.10	1.90	2.00	1.80	1.90
Average	*1.42*	*1.45*	*1.32*	*1.32*	*1.50*	*1.15*	*1.31*	*2.55*	*3.67*	*2.99*	*2.53*	*2.95*	*1.94*	*1.71*	*2.43*	*2.19*	*1.99*	*1.95*	*1.83*	*1.87*

No. 28 Gage Black Sheets, at Pittsburgh, Cents a Pound

While No. 24 gage was made the base in 1926, this table has been continued at No. 28 gage, to preserve comparisons with past years.

	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	2.50	2.40	2.20	1.90	2.31	1.87	1.80	2.60	4.50	5.00	4.70	4.48	4.35	3.00	3.35	3.83	3.60	3.35	3.16	3.05
February	2.50	2.40	2.20	1.87	2.35	1.95	1.80	2.60	4.69	5.00	4.70	5.00	4.21	3.00	3.46	3.85	3.50	3.28	3.05	3.15
March	2.25	2.40	2.20	1.80	2.35	1.95	1.80	2.71	4.94	5.00	4.61	5.50	3.88	3.00	3.71	3.78	3.44	3.25	3.00	3.14
April	2.20	2.40	2.20	1.86	2.35	1.91	1.80	2.85	5.75	5.00	4.35	5.50	3.88	3.11	4.00	3.71	3.35	3.25	2.99	3.05
May	2.20	2.40	2.20	1.90	2.30	1.85	1.79	2.89	7.00	5.00	4.35	5.50	4.00	3.15	3.88	3.60	3.20	3.18	3.11	2.96
June	2.20	2.40	2.00	1.90	2.27	1.81	1.75	2.90	7.88	5.00	4.35	5.50	3.80	3.15	3.85	3.53	3.15	3.10	3.25	2.90
July	2.20	2.24	2.00	1.95	2.25	1.80	1.75	2.90	8.50	5.00	4.35	6.75	3.31	3.15	3.81	3.46	3.13	3.10	3.25	2.87
August	2.20	2.21	1.99	2.02	2.21	1.86	1.85	2.90	8.50	5.00	4.35	7.50	2.90	3.23	3.75	3.45	3.15	3.10	3.25	2.90
September	2.26	2.15	1.91	2.07	2.14	1.95	1.90	2.93	8.50	5.00	4.35	7.38	2.81	3.35	3.75	3.50	3.14	3.15	3.25	2.90
October	2.30	2.20	1.85	2.21	2.04	1.94	2.03	3.23	...	5.05	4.35	6.69	3.00	3.47	3.75	3.50	3.11	3.23	3.15	3.00
November	2.30	2.20	1.85	2.25	1.97	1.87	2.25	3.65	5.00	5.00	4.35	5.77	2.86	3.35	3.75	3.50	3.25	3.25	3.03	3.00
December	2.40	2.19	1.84	2.25	1.89	1.82	2.50	4.31	5.00	4.85	4.35	4.35	3.00	3.35	3.75	3.54	3.33	3.25	3.03	3.08
Average	*2.29*	*2.30*	*2.04*	*2.00*	*2.20*	*1.88*	*1.92*	*3.04*	*6.39*	*4.99*	*4.43*	*5.83*	*3.50*	*3.19*	*3.73*	*3.60*	*3.28*	*3.21*	*3.13*	*3.00*

Automobile Body Sheets, Base No. 22 Gage, f.o.b. Pittsburgh, Cents a Pound

	1921	1922	1923	1924	1925	1926	1927	1928
January	5.20	4.35	4.70	5.35	4.75	4.50	4.18	4.00
February	5.20	4.35	4.78	5.35	4.68	4.43	4.15	4.08
March	5.20	4.35	5.00	5.35	4.46	4.40	4.15	4.15
April	5.20	4.40	5.00	5.25	4.40	4.33	4.15	4.04
May	5.20	4.45	5.35	5.10	4.40	4.29	4.15	4.00
June	4.95	4.50	5.35	5.10	4.22	4.20	4.25	4.00
July	4.70	4.60	5.35	5.06	4.15	4.20	4.25	4.00
August	4.65	4.75	5.35	4.75	4.25	4.20	4.25	4.00
September	4.45	4.85	5.35	4.72	4.25	4.25	4.25	4.00
October	4.55	4.85	5.35	4.60	4.29	4.25	4.15	4.00
November	4.35	4.85	5.35	4.60	4.40	4.25	4.12	4.00
December	4.35	4.70	5.35	4.75	4.50	4.25	4.00	4.08
Average	*4.83*	*4.58*	*5.19*	*5.00*	*4.39*	*4.30*	*4.17*	*4.03*

Blue Annealed Sheets, Base Nos. 9 and 10 Gage, Cents a Pound at Pittsburgh

	1921	1922	1923	1924	1925	1926	1927	1928
January	3.55	2.25	2.52	3.00	2.70	2.50	2.25	2.10
February	3.29	2.25	2.64	3.00	2.70	2.50	2.20	2.10
March	3.04	2.25	2.95	2.93	2.69	2.50	2.20	2.10
April	3.05	2.36	3.25	2.86	2.53	2.43	2.18	2.08
May	3.10	2.40	3.20	2.80	2.40	2.40	2.22	2.00
June	2.88	2.40	3.00	2.76	2.31	2.32	2.25	2.00
July	2.55	2.40	3.00	2.68	2.30	2.30	2.25	2.00
August	2.31	2.44	3.00	2.63	2.30	2.30	2.25	2.00
September	2.23	2.50	3.00	2.69	2.25	2.30	2.25	2.00
October	2.25	2.60	3.00	2.70	2.26	2.30	2.14	2.00
November	2.25	2.55	3.00	2.70	2.40	2.30	2.10	2.00
December	2.25	2.50	3.00	2.70	2.50	2.30	2.10	2.08
Average	*2.73*	*2.41*	*2.96*	*2.79*	*2.45*	*2.37*	*2.20*	*2.04*

Hot-Rolled and Cold-Rolled Strip Steel

Quoted in Cents a Pound, at Pittsburgh

	HOT-ROLLED STRIP STEEL									COLD-ROLLED STRIP STEEL									
	1920	1921	1922	1923	1924	1925	1926	1927	1928	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	3.45	3.30	2.00	2.75	3.00	2.25	2.30	2.34	2.01	6.00	6.25	3.50	4.50	5.00	4.00	3.90	2.95	3.00
February	4.63	3.11	1.84	2.86	3.00	2.35	2.30	2.21	2.08	7.00	6.06	3.50	4.69	4.75	4.00	3.90	2.80	3.00
March	5.00	2.93	1.81	3.18	2.93	2.40	2.30	2.30	2.10	7.00	5.83	3.50	5.00	4.75	4.00	3.90	2.92	3.00
April	5.25	2.76	1.98	3.30	2.75	2.40	2.30	2.30	2.10	7.75	5.54	3.61	5.25	4.75	4.00	3.79	3.00	3.00
May	5.50	2.53	2.20	3.30	2.75	2.20	2.30	2.30	1.96	8.50	4.98	3.71	5.25	4.50	3.94	3.75	3.00	3.00
June	5.50	2.50	2.40	3.23	2.50	2.20	2.30	2.30	1.85	8.50	4.88	4.00	5.19	4.50	3.53	3.72	3.19	3.00
July	5.50	2.46	2.50	3.00	2.50	2.20	2.30	2.30	1.85	8.50	4.25	4.00	5.00	4.30	3.63	3.60	3.25	2.92
August	5.50	2.23	2.60	3.00	2.35	2.20	2.30	2.30	1.85	8.50	3.96	4.10	5.00	4.13	3.75	3.60	3.25	2.90
September	5.50	2.00	2.75	3.00	2.25	2.20	2.30	2.30	1.85	8.50	3.78	4.25	5.00	4.00	3.75	3.50	3.25	2.72
October	5.25	2.00	2.90	3.00	2.25	2.23	2.30	2.19	1.85	8.25	3.75	4.50	5.00	4.00	3.75	3.25	3.00	2.75
November	4.70	2.00	2.83	3.00	2.25	2.30	2.30	2.19	1.88	8.00	3.75	4.50	4.98	4.00	3.90	3.25	3.00	2.85
December	3.65	2.00	2.75	2.88	2.25	2.30	2.30	2.03	1.80	6.63	3.75	4.50	4.91	4.00	3.90	3.00	3.00	2.85
Average	*4.95*	*2.49*	*2.38*	*3.04*	*2.57*	*2.27*	*2.30*	*2.26*	*1.93*	*7.76*	*4.73*	*3.97*	*4.98*	*4.39*	*3.85*	*3.60*	*3.05*	*2.92*

Wrought Iron and Steel Pipe Prices

Computed from discounts as per list, with "trimmings," for carload lots; price for base size pipe, ¾ to 3-in.

Steel Pipe, per Net Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$36.10	$35.20	$34.20	$41.39	$64.84	$88.92	$83.36	$80.64	$77.30	$51.87	$61.13	$70.30	$70.30	$70.30	$70.30	$68.60
February	36.10	36.09	35.42	43.63	66.95	88.92	83.36	83.36	76.88	51.87	66.50	70.30	70.30	70.30	70.30	68.60
March	36.10	36.12	36.10	47.51	72.07	88.92	81.06	83.36	76.88	51.87	66.50	70.30	70.30	70.30	70.30	68.60
April	36.60	35.54	36.10	51.25	81.51	88.92	76.88	83.36	71.63	51.87	68.02	70.30	70.30	70.30	70.30	69.33
May	37.20	35.20	38.00	53.72	92.62	88.92	76.88	83.36	67.62	51.87	70.30	70.30	70.30	70.30	70.30	70.30
June	38.00	35.20	38.00	53.72	95.21	88.92	76.88	83.36	67.62	51.87	70.30	70.30	70.30	70.30	70.30	70.30
July	38.00	35.20	38.00	53.72	105.59	88.92	76.88	83.36	64.63	51.87	70.30	70.30	70.30	70.30	70.30	70.30
August	36.53	35.20	38.00	53.72	105.59	88.92	76.88	83.36	63.91	54.74	70.30	70.30	70.30	70.30	70.30	70.30
September	36.10	35.20	38.00	55.21	105.59	88.92	76.88	83.36	60.21	57.43	70.30	70.30	70.30	70.30	70.30	70.30
October	35.95	35.20	38.00	55.58	105.59	88.92	76.88	83.36	56.50	58.74	70.30	70.30	70.30	70.30	68.54	70.30
November	35.20	34.23	39.90	56.57	91.70	88.92	76.88	83.36	56.50	61.13	70.30	70.30	70.30	70.30	66.79	70.30
December	35.20	34.20	39.90	61.01	88.92	88.92	76.88	83.36	53.96	61.13	70.30	70.30	70.30	70.30	66.79	70.30
Average	*36.42*	*35.22*	*37.47*	*52.25*	*81.73*	*88.92*	*78.31*	*83.13*	*66.14*	*54.69*	*68.71*	*70.30*	*70.30*	*70.30*	*69.57*	*69.84*

Wrought Iron Pipe, per Net Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$49.40	$51.30	$51.30	$58.64	$83.36	$122.27	$116.71	$115.60	$135.06	$100.96	$122.56	$131.10	$131.10	$127.82	$127.82	$127.82
February	49.40	51.30	51.30	62.16	85.48	122.27	116.71	119.49	136.16	100.96	127.82	131.10	131.10	127.82	127.82	127.82
March	49.40	51.30	51.30	66.03	90.65	122.27	114.41	119.49	136.16	100.96	127.82	131.10	127.82	127.82	127.82	127.82
April	50.00	51.30	51.30	69.78	101.89	122.27	110.22	119.49	125.66	100.96	129.02	131.10	127.82	127.82	127.82	127.82
May	50.48	51.30	53.20	72.25	113.00	122.27	110.22	119.49	117.63	100.96	131.10	131.10	127.82	127.82	127.82	127.82
June	51.30	51.30	53.20	72.25	114.85	122.27	110.22	119.49	117.63	100.96	131.10	131.10	127.82	127.82	127.82	127.82
July	51.30	51.30	53.20	72.25	122.27	122.27	110.22	119.49	111.65	100.96	131.10	131.10	127.82	127.82	127.82	127.82
August	51.30	51.30	53.20	72.25	122.27	122.27	110.22	119.49	110.22	105.74	131.10	131.10	127.82	127.82	127.82	127.82
September	51.30	51.30	53.20	73.73	122.27	122.27	110.22	119.49	105.59	116.33	131.10	131.10	127.82	127.82	127.82	127.82
October	51.30	51.30	53.20	74.10	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82
November	51.30	51.30	55.10	75.07	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82
December	51.30	51.30	55.10	79.50	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82
Average	*50.65*	*51.30*	*52.88*	*70.67*	*110.24*	*122.27*	*111.65*	*119.16*	*116.55*	*107.50*	*129.67*	*131.10*	*128.37*	*127.82*	*127.82*	*127.82*

Cast Iron Pipe Prices, 1913 to 1928

At New York, 6-In. per Net Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$25.00	$22.00	$20.00	$29.00	$41.50	$55.35	$65.70	$66.30	$63.30	$47.30	$54.90	$61.60	$54.60	$50.60	$48.60	$37.35
February	24.75	22.00	20.00	29.33	41.50	55.35	62.70	70.30	63.30	47.30	56.50	61.60	54.60	50.60	48.60	37.35
March	23.87	22.00	20.00	29.75	43.10	55.35	62.70	71.30	63.30	47.68	57.75	61.60	53.00	50.60	47.20	37.35
April	23.50	22.00	21.60	30.50	50.88	55.35	57.70	73.90	63.30	48.80	58.50	61.60	52.60	50.60	47.35	36.35
May	23.00	20.88	22.00	30.50	55.50	56.60	54.45	76.30	62.05	49.60	58.50	61.60	50.85	50.60	45.80	37.60
June	23.00	20.50	22.25	30.50	60.75	61.44	52.03	76.30	54.30	50.80	61.35	61.60	50.60	50.60	44.42	37.60
July	23.00	20.50	22.50	30.50	65.50	61.75	50.46	76.30	52.30	53.50	62.30	60.60	50.60	50.60	42.75	37.60
August	23.00	20.50	23.25	30.50	65.50	61.75	52.33	76.53	46.05	54.10	62.62	59.60	50.60	50.60	39.65	36.60
September	23.00	20.40	24.37	30.83	65.50	61.75	54.30	77.22	46.30	54.50	63.60	56.60	50.60	49.85	37.25	35.60
October	23.00	20.00	25.25	31.50	61.00	67.70	55.30	77.22	47.30	54.50	63.60	56.35	50.60	49.60	36.50	35.60
November	23.00	20.00	26.50	35.50	56.50	67.70	58.30	77.22	47.30	54.50	63.60*	55.60	50.60	49.60	36.25	37.32
December	22.33	20.00	27.60	41.00	56.50	67.70	61.30	68.87	47.30	54.75	63.60*	55.20	50.60	49.10	37.00	39.40
Average	*23.37*	*20.90*	*22.94*	*31.62*	*55.31*	*60.65*	*57.27*	*73.98*	*54.68*	*51.44*	*60.57*	*59.46*	*51.65*	*50.25*	*42.61*	*37.11*

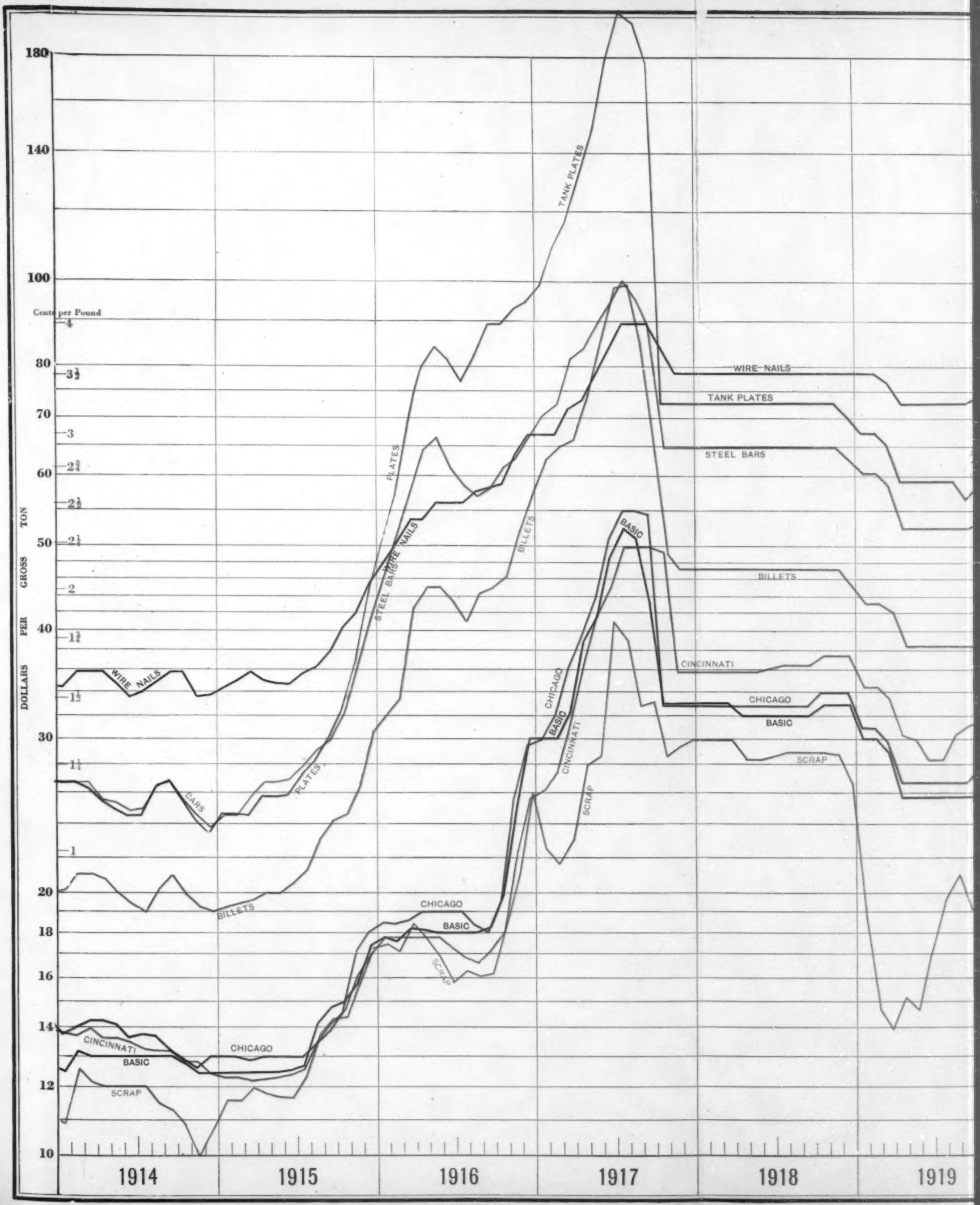
*Concession of $2 to $3 per ton from this price to consumers willing to accept winter delivery.

Cast Iron Pipe, Delivered Chicago, 6-In. and Larger, per Net Ton

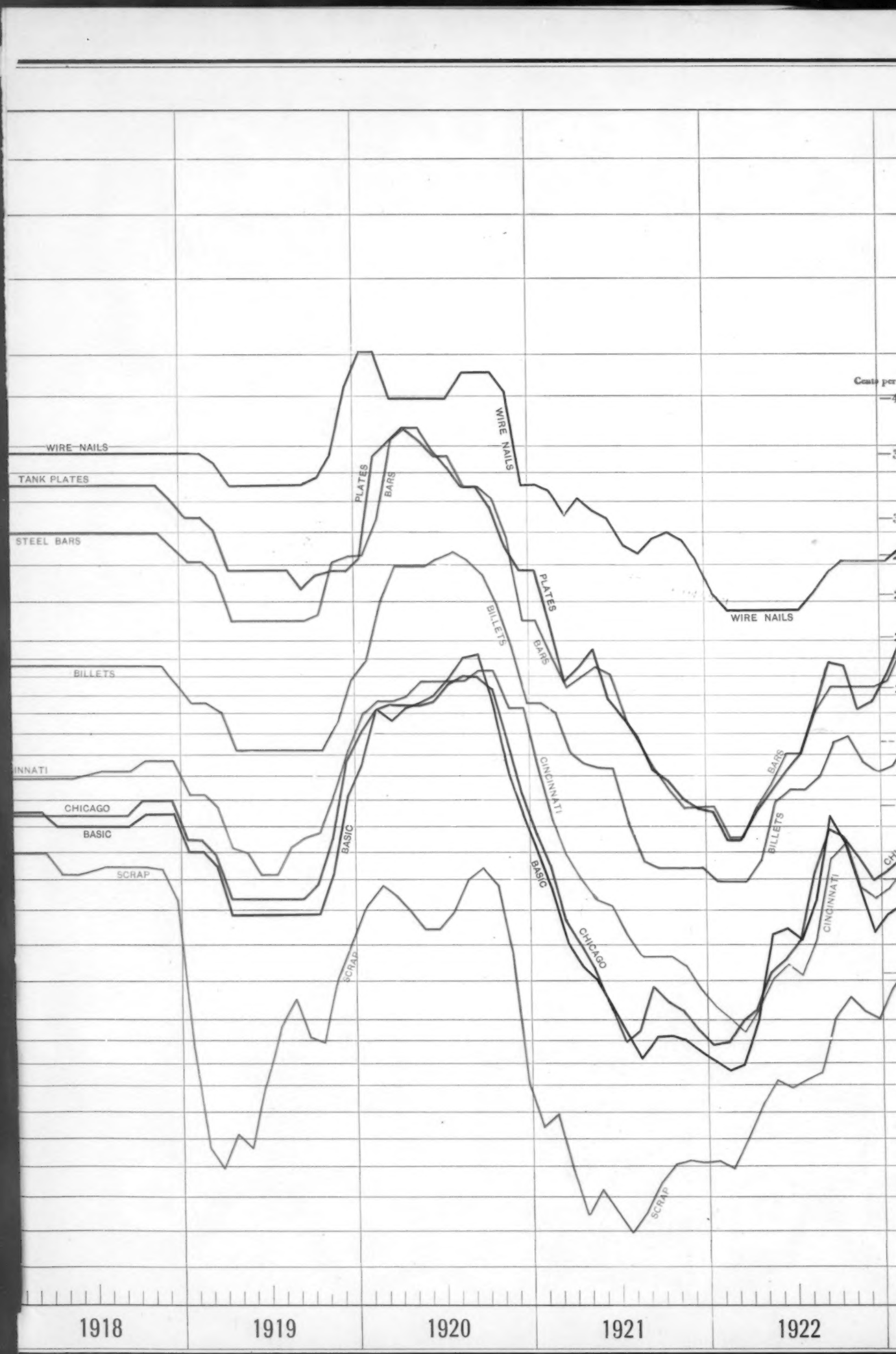
	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$29.00	$25.00	$23.50	$29.00	$41.50	$54.30	$64.30	$67.55	$64.10	$42.50	$51.80	$56.20	$48.70	$49.20	$44.33	$35.00
February	29.00	25.00	23.50	29.50	41.75	54.30	61.80	71.30	64.10	41.60	53.20	56.20	49.95	49.20	43.70	35.83
March	27.83	24.20	23.50	29.50	43.00	54.30	60.55	72.80	64.10	42.10	54.20	56.20	47.60	49.20	44.20	35.70
April	28.10	24.00	23.50	30.50	53.00	54.30	56.80	74.80	64.10	42.85	57.20	56.20	46.70	49.20	43.95	36.20
May	26.50	24.00	23.50	30.50	55.50	55.81	54.30	76.80	60.10	44.60	60.20	55.20	47.07	49.20	43.20	37.50
June	26.50	24.00	23.70	30.50	60.75	60.83	51.80	76.80	52.85	46.10	60.20	54.70	47.70	48.90	42.70	40.20
July	26.20	24.00	24.00	30.50	65.50	62.05	52.60	76.80	48.85	45.57	60.20	54.80	48.20	47.95	41.58	40.30
August	26.00	24.00	24.00	30.50	65.50	61.80	55.30	78.18	43.20	46.40	60.20	53.45	49.20	48.30	37.40	42.20
September	26.00	24.00	24.70	31.00	65.50	61.80	55.80	82.10	42.60	47.45	59.95	51.80	49.20	47.58	34.58	42.20
October	26.00	24.00	25.75	31.50	53.50	66.80	59.00	83.10	42.60	51.20	57.40	49.70	49.20	47.20	34.20	43.00
November	25.63	24.00	27.00	36.25	54.25	66.80	59.80	83.10	42.90	51.20	55.45	48.20	50.20	47.20	34.50	45.20
December	25.00	23.50	27.77	41.00	55.21	66.80	64.40	68.60	43.10	51.20	55.20	47.60	50.20	46.70	35.08	42.80
Average	*26.81*	*24.14*	*24.54*	*31.69*	*54.58*	*59.99*	*58.04*	*76.00*	*52.72*	*46.06*	*57.10*	*53.35*	*48.66*	*48.32*	*39.95*	*39.66*

Southern Ohio No. 2 Foundry Iron, per Gross Ton, at Cincinnati

	1921	1922	1923	1924	1925	1926	1927	1928
January	$33.78	$22.15	$29.78	$25.18	$24.27	$23.27	$21.89	$20.89
February	32.03	22.03	30.28	26.03	24.27	22.92	21.39	20.89
March	29.93	21.38	32.68	25.78	23.87	22.89	21.26	20.89
April	28.28	22.78	33.14	25.39	23.15	21.99	21.39	20.89
May	27.03	25.28	32.23	24.39	21.77	21.76	21.19	20.89
June	25.73	25.53	30.53	22.53	21.27	20.89	20.89	20.39
July	23.93	26.40	28.71	21.58	21.27	21.29	20.76	19.89
August	22.53	30.18	28.08	21.78	21.77	21.39	20.39	19.89
September	23.13	34.28	27.03	22.15	21.77	21.39	20.89	18.89
October	23.53	34.53	26.93	22.28	21.90	21.39	20.89	19.19
November	22.73	31.83	24.78	22.90	23.27	21.89	20.89	20.27
December	22.27	29.28	24.78	23.88	23.27	21.89	20.89	20.39
Average	*26.49*	*27.14*	*28.75*	*23.66*	*22.65*	*21.91*	*21.06*	*20.28*



Fifteen Years of Prices



Fifteen Years of Prices of Pig Iron, Finished and Semi-Finished Steel a

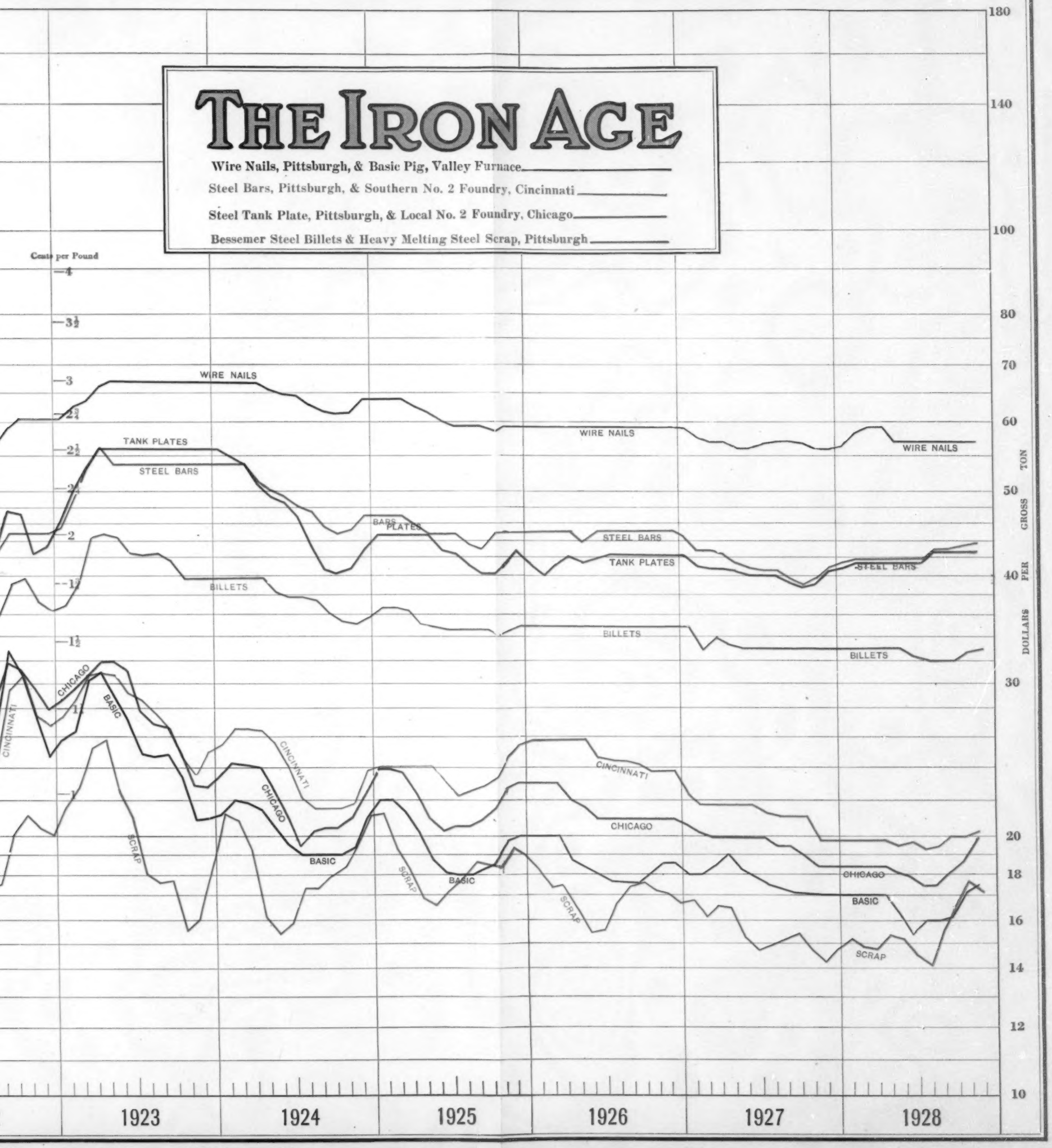
THE IRON AGE

Wire Nails, Pittsburgh, & Basic Pig, Valley Furnace

Steel Bars, Pittsburgh, & Southern No. 2 Foundry, Cincinnati

Steel Tank Plate, Pittsburgh, & Local No. 2 Foundry, Chicago

Bessemer Steel Billets & Heavy Melting Steel Scrap, Pittsburgh



Steel and Heavy Melting Scrap

Eight Years of Finished Iron and Steel, Chicago and Pittsburgh

Sheets, Bars and Beams at Chicago—Rivets, Cotton Ties and Cold-Finished Bars at Pittsburgh

Black Sheets, No. 28 Gage, at Chicago, Cents a Pound

	1921	1922	1923	1924	1925	1926	1927	1928
January	4.73	3.38	3.69	4.17	3.75	3.50	3.45	3.28
February	4.57	3.38	3.69	4.19	3.75	3.50	3.23	3.30
March	4.40	3.38	3.90	4.14	3.75	3.50	3.25	3.30
April	4.21	3.46	4.25	4.03	3.65	3.48	3.25	3.26
May	4.38	3.53	4.19	3.99	3.48	3.40	3.37	3.12
June	4.15	3.53	4.19	3.99	3.32	3.31	3.40	3.08
July	3.76	3.49	4.19	3.84	3.35	3.30	3.40	3.05
August	3.33	3.57	4.19	3.84	3.35	3.30	3.40	3.05
September	3.19	3.69	4.12	3.93	3.35	3.33	3.40	3.05
October	3.34	3.69	4.09	3.65	3.31	3.43	3.30	3.11
November	3.38	3.69	4.09	3.68	3.43	3.50	3.19	3.15
December	3.38	3.69	4.09	3.75	3.50	3.50	3.15	3.18
Average	*3.86*	*3.54*	*4.06*	*3.93*	*3.50*	*3.42*	*3.32*	*3.16*

Galvanized Steel Sheets, No. 28 Gage, at Chicago, Cents a Pound

	1921	1922	1923	1924	1925	1926	1927	1928
January	6.08	4.38	4.69	5.34	4.90	4.75	4.53	4.38
February	5.88	4.38	4.69	5.34	4.90	4.75	4.40	4.40
March	5.44	4.38	5.02	5.29	4.88	4.75	4.40	4.40
April	5.18	4.46	5.28	5.21	4.75	4.75	4.40	4.36
May	5.38	4.53	5.34	5.12	4.55	4.68	4.48	4.25
June	5.13	4.53	5.34	5.14	4.39	4.55	4.50	4.20
July	4.76	4.49	5.34	5.00	4.38	4.45	4.50	4.15
August	4.33	4.67	5.34	4.94	4.39	4.45	4.50	4.15
September	4.19	4.69	5.34	5.00	4.40	4.44	4.50	4.15
October	4.34	4.69	5.34	4.75	4.41	4.54	4.45	4.15
November	4.38	4.69	5.22	4.79	4.68	4.60	4.35	4.15
December	4.38	4.69	5.24	4.90	4.75	4.60	4.20	4.18
Average	*4.91*	*4.54*	*5.18*	*5.07*	*4.62*	*4.61*	*4.43*	*4.24*

Blue Annealed Sheets, Nos. 9 and 10 Gage, at Chicago, Cents a Pound

	1921	1922	1923	1924	1925	1926	1927	1928
January	3.93	2.63	2.84	3.34	2.85	2.65	2.56	2.24
February	3.72	2.63	2.84	3.34	2.85	2.65	2.36	2.25
March	3.43	2.63	3.03	3.29	2.83	2.65	2.39	2.25
April	3.26	2.71	3.32	3.21	2.75	2.65	2.40	2.24
May	3.48	2.78	3.34	3.14	2.55	2.65	2.40	2.20
June	3.26	2.78	3.34	3.14	2.44	2.49	2.40	2.18
July	2.93	2.74	3.34	3.07	2.48	2.45	2.40	2.15
August	2.63	2.78	3.34	3.04	2.45	2.45	2.40	2.15
September	2.63	2.84	3.34	3.10	2.45	2.45	2.40	2.15
October	2.63	2.84	3.34	2.85	2.45	2.53	2.38	2.15
November	2.63	2.84	3.34	2.85	2.58	2.55	2.27	2.15
December	2.63	2.84	3.34	2.85	2.65	2.55	2.15	2.18
Average	*2.96*	*2.75*	*3.23*	*3.10*	*2.61*	*2.56*	*2.38*	*2.19*

Rail Steel Bars at Chicago Mill, Cents a Pound

	1921	1922	1923	1924	1925	1926	1927	1928
January	2.60	1.56	2.00	2.30	2.03	2.00	1.90	1.80
February	2.41	1.50	2.10	2.30	2.10	2.00	1.90	1.80
March	2.23	1.50	2.28	2.30	2.10	2.00	1.90	1.80
April	2.25	1.55	2.33	2.30	2.10	2.00	1.90	1.83
May	2.05	1.60	2.30	2.20	2.10	1.98	1.90	1.85
June	1.95	1.63	2.28	2.15	2.02	1.96	1.90	1.86
July	1.90	1.70	2.30	2.10	2.00	1.98	1.90	1.85
August	1.76	1.89	2.30	2.05	2.00	2.00	1.90	1.85
September	1.75	2.00	2.30	2.00	2.00	2.00	1.90	1.85
October	1.68	2.00	2.30	2.00	2.00	2.00	1.83	1.95
November	1.65	2.00	2.30	2.00	2.00	1.96	1.80	1.95
December	1.75	2.00	2.30	2.00	2.00	1.90	1.80	1.95
Average	*1.99*	*1.75*	*2.25*	*2.14*	*2.04*	*1.98*	*1.88*	*1.86*

Cotton Tie Prices for Twenty-Four Years

(Per Bundle of 45-Lb., f.o.b. Pittsburgh)

1905	$0.85	1913	$0.80	1921	$1.30
1906	0.85	1914	0.65	1922	1.10
1907	0.95	1915	0.85	1923	1.60
1908	0.85	1916	1.35	1924	*1.40
1909	0.70	1917	2.10	1925	†1.25
1910	0.75	1918	2.10	1926	‡1.20
1911	0.75	1919	1.70	1927	**1.20
1912	0.70	1920	2.00	1928	(a)1.27

*F.o.b. Atlantic and Gulf ports.
†F.o.b. Gulf ports; $1.28, f.o.b. Atlantic ports.
‡F.o.b. Gulf ports; $1.22, f.o.b. Atlantic ports.
**F.o.b. Gulf ports; $1.21, f.o.b. Atlantic ports.
(a) In lots of 2000 bundles, $1.25; larger lots, $1.23.

Common Bar Iron at Chicago, Cents a Pound

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	2.68	1.60	2.35	2.40	2.00	2.00	2.00	1.90
Feb.	2.65	1.58	2.46	2.40	2.03	2.00	2.00	1.93
March	2.60	1.58	2.53	2.40	2.10	2.00	2.00	2.00
April	2.38	1.63	2.60	2.35	2.10	2.00	2.00	2.00
May	2.35	1.67	2.60	2.28	2.08	2.00	2.00	2.00
June	2.23	1.74	2.55	2.23	2.01	2.00	2.00	2.00
July	1.96	1.85	2.50	2.20	1.96	2.00	2.00	2.00
Aug.	1.75	2.11	2.40	2.18	1.90	2.00	2.00	2.00
Sept.	1.75	2.25	2.39	2.14	1.90	2.00	1.98	2.00
Oct.	1.75	2.50	2.38	2.10	1.90	2.00	1.88	2.00
Nov.	1.73	2.50	2.40	2.08	1.94	2.00	1.88	2.00
Dec.	1.63	2.35	2.40	2.01	2.00	2.00	1.90	2.00
Aver.	*2.12*	*1.95*	*2.47*	*2.23*	*1.99*	*2.00*	*1.97*	*1.99*

Soft Steel Bars at Chicago, Cents a Pound

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	2.73	1.60	2.08	2.50	2.13	2.10	2.10	1.91
Feb.	2.57	1.53	2.21	2.50	2.20	2.10	2.03	1.95
March	2.40	1.55	2.45	2.50	2.20	2.10	2.00	1.98
April	2.43	1.60	2.84	2.38	2.15	2.10	2.00	2.00
May	2.48	1.66	2.74	2.30	2.10	2.10	2.00	2.00
June	2.37	1.75	2.60	2.25	2.10	2.10	2.00	2.00
July	2.21	1.75	2.60	2.19	2.10	2.10	2.00	2.00
Aug.	1.96	2.05	2.60	2.13	2.10	2.10	1.98	2.00
Sept.	1.78	2.10	2.50	2.02	2.10	2.10	1.90	2.00
Oct.	1.75	2.10	2.50	2.00	2.10	2.10	1.85	2.00
Nov.	1.67	2.10	2.50	2.05	2.10	2.10	1.87	2.00
Dec.	1.60	2.10	2.50	2.10	2.10	2.10	1.90	2.00
Aver.	*2.16*	*1.83*	*2.51*	*2.24*	*2.12*	*2.10*	*1.97*	*1.99*

Structural Steel Beams at Chicago, Cents a Pound

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	2.83	1.60	2.18	2.60	2.23	2.10	2.10	1.91
Feb.	2.67	1.53	2.31	2.60	2.30	2.10	2.03	1.95
March	2.50	1.55	2.52	2.60	2.30	2.10	2.00	1.98
April	2.53	1.60	2.34	2.50	2.25	2.10	2.00	2.00
May	2.58	1.66	2.34	2.45	2.20	2.10	2.00	2.00
June	2.48	1.75	2.70	2.39	2.18	2.10	2.00	2.00
July	2.28	1.75	2.70	2.27	2.10	2.10	2.00	2.00
Aug.	1.99	2.05	2.70	2.20	2.10	2.10	1.94	2.00
Sept.	1.79	2.20	2.60	2.06	2.10	2.10	1.90	2.00
Oct.	1.75	2.20	2.60	2.00	2.10	2.10	1.85	2.00
Nov.	1.69	2.20	2.60	2.15	2.10	2.10	1.87	2.00
Dec.	1.63	2.20	2.60	2.20	2.10	2.10	1.90	2.00
Aver.	*2.23*	*1.86*	*2.59*	*2.33*	*2.17*	*2.10*	*1.97*	*1.99*

Cold-Finished Steel Bars, Base per 100 Pounds, f.o.b. Pittsburgh

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	$3.60	$1.94	$2.53	$3.00	$2.80	$2.50	$2.30	$2.20
Feb.	3.60	1.90	2.73	2.95	2.80	2.50	2.30	2.20
March	3.20	1.80	2.85	2.98	2.72	2.50	2.38	2.20
April	3.05	1.85	3.00	3.00	2.70	2.50	2.40	2.20
May	3.10	1.94	3.25	2.90	2.70	2.50	2.40	2.20
June	3.00	2.03	3.25	2.90	2.60	2.50	2.33	2.20
July	2.69	2.10	3.25	2.84	2.60	2.50	2.20	2.10
Aug.	2.40	2.23	3.25	2.80	2.50	2.50	2.20	2.10
Sept.	2.36	2.50	3.25	2.74	2.46	2.50	2.15	2.10
Oct.	2.18	2.50	3.10	2.70	2.40	2.40	2.10	2.16
Nov.	2.09	2.50	2.95	2.70	2.48	2.30	2.10	2.20
Dec.	2.00	2.50	3.00	2.78	2.50	2.30	2.10	2.20
Aver.	*2.77*	*2.15*	*3.03*	*2.86*	*2.61*	*2.46*	*2.25*	*2.17*

Large Structural Rivets, Base per 100 Pounds, f.o.b. Pittsburgh

	1921	1922	1923	1924	1925	1926	1927	1928
January	$4.13	$2.25	$3.00	$2.90	$2.60	$2.60	$2.34	$2.75
February	3.90	2.18	3.00	2.75	2.60	2.53	2.30	2.75
March	3.78	2.00	3.25	2.75	2.60	2.50	2.30	2.90
April	3.55	2.10	3.25	2.65	2.58	2.50	2.75	2.90
May	3.32	2.24	3.25	2.65	2.45	2.50	2.75	2.90
June	3.03	2.36	3.25	2.61	2.40	2.50	2.75	2.90
July	2.71	2.46	3.13	2.60	2.40	2.50	2.75	2.90
August	2.50	2.65	3.00	2.55	2.40	2.50	2.75	2.90
September	2.24	3.00	2.95	2.60	2.40	2.48	2.75	2.90
October	2.36	3.12	2.75	2.58	2.40	2.45	2.75	2.90
November	2.25	3.10	2.68	2.60	2.60	2.45	3.00	2.90
December	2.25	3.00	2.90	2.60	2.60	2.40	2.75	2.90
Average	*3.00*	*2.55*	*3.02*	*2.65*	*2.50*	*2.50*	*2.66*	*2.88*

Monthly Averages of Ferroalloy Quotations

Ferromanganese (80 Per Cent) Prices in Dollars per Gross Ton, at Seaboard

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$68.00	$44.40	$68.00	$150.00	$175.00	$250.00	$255.00	$146.00	$112.50	$58.35	$105.00	$108.70	$112.50	$115.00	$100.00	$100.00
February	65.00	39.25	69.75	207.50	231.25	250.00	215.00	172.50	100.00	60.42	107.50	107.50	115.00	115.00	100.00	100.00
March	65.00	38.50	100.00	349.60	290.00	250.00	175.00	216.25	96.00	62.50	113.75	107.50	115.00	97.60	100.00	100.00
April	61.00	38.00	100.00	406.25	362.50	290.00	150.00	240.00	90.00	64.37	120.00	107.50	115.00	88.00	100.00	100.00
May	61.00	38.00	100.00	387.50	420.50	290.00	138.40	250.00	85.00	66.87	128.00	107.50	115.00	88.00	94.00	103.00
June	61.00	38.00	100.00	270.00	443.75	290.00	121.00	225.00	80.00	67.50	128.75	107.50	115.00	88.00	90.00	105.00
July	59.00	37.20	109.00	175.00	406.25	290.00	111.00	225.00	70.60	67.50	*119.50	106.50	115.00	88.00	90.00	105.00
August	56.38	108.33	127.25	172.00	400.00	290.00	101.25	198.75	70.00	67.50	117.50	95.75	115.00	88.00	90.00	105.00
September	56.00	90.00	117.00	169.75	387.50	285.00	98.75	170.00	65.80	75.63	*111.25	90.00	115.00	88.00	90.00	105.00
October	50.10	70.40	105.00	162.25	310.00	285.00	105.00	170.00	63.00	100.00	*110.00	90.00	115.00	88.00	90.00	105.00
November	50.00	68.00	105.00	160.80	256.00	285.00	112.50	170.00	61.50	100.00	*108.75	98.75	115.00	96.60	90.00	105.00
December	47.00	72.20	106.00	169.75	243.75	275.00	122.50	135.00	60.00	100.00	*108.25	107.00	115.00	100.00	100.00	105.00
Average	*58.29*	*56.86*	*105.83*	*231.70*	*327.21*	*277.50*	*142.12*	*193.21*	*79.53*	*74.22*	*114.85*	*102.85*	*114.79*	*95.02*	*94.50*	*103.17*

*Price at furnace, where lower than price at seaboard.

Spiegeleisen (19 to 21 Per Cent), Dollars per Gross Ton at Furnace

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$25.00	$25.00	$30.38	$60.00	$60.00	$66.00	$51.40	$45.00	$26.00	$34.40	$38.00	$33.00	$32.00	$37.00	$30.50
February	25.00	25.00	36.25	68.75	61.25	60.75	58.75	40.00	38.00	35.50	38.00	33.00	32.00	37.00	31.00
March	25.00	25.00	57.00	75.00	71.25	47.00	60.00	35.00	29.40	40.00	38.00	33.00	32.00	37.00	31.00
April	25.00	25.00	65.00	75.00	80.75	45.00	67.60	34.00	32.25	45.00	36.80	33.00	32.00	37.00	31.00
May	25.00	25.00	65.00	81.00	84.00	37.40	75.00	32.00	35.00	52.50	36.00	33.00	32.00	36.25	31.00
June	25.00	25.00	61.00	82.50	89.00	31.25	75.00	32.00	36.00	48.50	35.00	32.80	32.00	35.50	31.00
July	25.00	25.00	52.50	85.00	89.00	35.00	75.00	27.00	36.00	44.00	34.20	32.00	32.00	33.50	31.00
August	25.00	25.00	45.00	85.00	89.00	35.00	80.00	26.00	37.80	46.75	32.50	32.00	32.00	33.00	32.50
September	25.00	26.60	45.00	82.50	83.75	35.00	82.00	26.00	38.25	43.75	31.40	31.80	32.00	33.00	32.00
October	25.00	29.25	42.75	76.25	82.00	35.00	81.88	26.00	38.00	43.75	30.75	31.25	32.00	30.75	32.00
November	25.00	29.25	45.40	66.00	80.25	37.00	75.62	26.00	37.50	41.25	30.25	32.00	37.40	30.00	30.00
December	25.00	29.25	55.00	60.00	74.38	40.00	59.10	26.00	37.50	39.00	32.00	32.00	36.50	30.00	31.00
Average	*25.00*	*26.20*	*50.02*	*74.75*	*78.72*	*42.03*	*70.11*	*31.25*	*34.31*	*42.87*	*34.41*	*32.40*	*32.83*	*34.17*	*31.36*

50 Per Cent Ferrosilicon (Per Gross Ton, Delivered East of Mississippi)

	1921	1922	1923	1924	1925	1926	1927	1928
January	$75.00	$54.00	$82.50	$75.00	$82.50	$85.00	$85.00	$83.50
February	93.00	55.00	83.75	75.00	82.50	85.00	85.00	83.50
March	92.40	55.00	90.00	75.00	82.50	85.00	85.00	83.50
April	86.25	55.00	92.50	75.00	82.50	85.00	85.00	83.50
May	76.40	55.00	94.50	75.00	82.50	85.00	85.00	83.50
June	69.75	55.00	90.00	75.00	82.50	85.00	85.00	83.50
July	66.00	55.00	82.50	71.00	82.50	85.00	85.00	83.50
August	60.80	55.00	82.50	71.25	82.50	85.00	85.00	83.50
September	60.00	55.00	82.50	72.00	82.50	85.00	85.00	83.50
October	58.50	67.00	81.00	71.00	82.50	85.00	85.00	83.50
November	55.80	75.00	80.63	70.00	82.50	85.00	85.00	83.50
December	56.00	82.50	76.25	75.00	82.50	85.00	83.50	83.50
Average	*70.83*	*59.88*	*84.89*	*73.35*	*82.50*	*85.00*	*84.88*	*83.50*

Connellsville Coke Prices for Nineteen Years

Prompt Connellsville Furnace Coke, per Net Ton at Oven

	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$2.55	$1.40	$1.82	$3.88	$1.85	$1.50	$2.94	$9.50	$6.00	$5.65	$6.00	$5.06	$2.75	$8.05	$3.94	$3.94	$7.19	$3.50	$2.70
February	2.12	1.45	1.78	2.52	1.85	1.50	3.38	9.62	6.00	4.44	6.00	4.50	3.04	7.13	4.08	3.63	7.31	3.38	2.68
March	2.00	1.55	2.12	2.40	1.90	1.50	3.47	9.60	6.00	4.06	6.00	4.35	3.25	7.25	4.08	3.35	3.05	3.35	2.60
April	1.77	1.59	2.39	2.15	1.86	1.50	2.41	7.38	6.00	3.65	9.60	3.50	4.48	6.31	3.75	3.04	3.00	3.20	2.60
May	1.66	1.50	2.28	2.13	1.77	1.50	2.30	7.80	6.00	3.69	12.00	3.25	6.00	5.15	3.25	3.00	2.91	2.94	2.60
June	1.65	1.42	2.02	2.11	1.75	1.56	2.49	11.25	6.00	4.00	15.00	3.00	6.75	4.75	3.19	2.77	2.83	2.93	2.60
July	1.59	1.44	2.21	2.45	1.75	1.64	2.75	12.75	6.00	4.07	17.20	2.81	10.75	4.55	3.00	2.83	2.84	3.00	2.63
August	1.57	1.46	2.21	2.50	1.70	1.50	2.80	13.60	6.00	4.31	17.75	2.75	12.80	4.56	3.00	3.06	2.95	3.00	2.75
September	1.60	1.50	2.37	2.29	1.65	1.61	2.94	11.12	6.00	4.56	16.70	3.15	11.13	4.50	3.00	3.49	3.38	2.85	2.75
October	1.59	1.50	3.41	2.98	1.60	2.03	4.88	6.00	6.00	4.52	15.12	3.28	9.60	3.85	3.00	6.13	3.63	2.85	2.83
November	1.50	1.52	3.94	1.82	1.52	2.28	6.90	6.00	6.00	5.87	8.26	3.03	7.19	3.81	3.04	5.75	4.43	2.77	2.75
December	1.44	1.60	4.00	1.75	1.50	2.64	8.38	6.00	6.00	6.12	6.20	2.75	7.00	4.00	3.68	4.32	3.50	2.75	2.75
Average	*1.75*	*1.49*	*2.55*	*2.42*	*1.73*	*1.73*	*3.80*	*9.22*	*6.00*	*4.58*	*11.32*	*3.45*	*7.01*	*5.33*	*3.42*	*3.78*	*3.92*	*3.04*	*2.69*

Prompt Connellsville Foundry Coke, per Net Ton at Oven

	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$2.90	$1.90	$1.97	$4.40	$2.50	$2.00	$3.50	$9.75	$7.00	$6.25	$7.00	$6.38	$3.75	$8.70	$4.75	$4.38	$7.75	$4.50	$3.75
February	2.70	2.10	2.09	3.25	2.50	2.00	3.50	11.00	7.00	5.00	7.00	5.63	4.00	8.25	4.88	4.31	8.31	4.31	3.75
March	2.60	2.05	2.56	3.00	2.45	2.00	3.75	11.60	7.00	4.94	7.00	5.45	4.25	8.38	4.88	4.15	4.40	4.40	3.75
April	2.45	2.00	2.69	3.00	2.40	2.00	3.56	9.13	7.00	4.30	10.20	4.75	5.06	7.56	4.75	4.00	4.06	4.06	3.75
May	2.20	1.81	2.58	2.85	2.40	2.00	3.25	8.90	7.00	4.31	13.00	4.50	6.30	6.15	4.69	4.00	4.00	4.00	3.75
June	2.17	1.76	2.40	2.80	2.32	2.00	3.25	11.72	7.00	4.56	15.75	4.45	7.25	5.56	4.38	3.80	4.00	4.00	3.75
July	2.15	1.82	2.40	2.70	2.22	2.05	3.25	13.25	7.00	5.00	17.80	4.06	11.00	5.35	4.10	3.75	4.00	4.00	3.75
August	2.15	1.85	2.40	2.90	2.25	2.00	3.30	13.20	7.00	5.25	18.88	3.75	13.90	5.38	4.00	3.88	4.00	4.00	3.75
September	2.12	1.85	2.54	2.90	2.10	2.07	3.31	11.75	7.00	5.80	17.70	4.15	12.50	5.50	4.00	4.25	4.38	4.00	3.75
October	2.10	1.81	3.65	2.81	2.00	2.35	3.88	6.00	7.00	6.25	16.38	4.38	11.70	4.80	4.00	6.31	4.63	4.00	3.75
November	2.05	1.85	4.25	2.60	1.92	2.88	7.10	7.00	7.00	7.00	9.50	4.19	8.38	4.81	4.06	6.81	5.50	3.85	3.75
December	1.97	1.90	4.50	2.50	1.90	2.95	8.63	7.00	7.00	7.00	7.00	3.81	7.88	4.81	4.55	5.20	4.50	3.75	3.75
Average	*2.30*	*1.89*	*2.84*	*2.98*	*2.25*	*2.19*	*4.19*	*10.03*	*7.00*	*5.47*	*12.27*	*4.63*	*8.00*	*6.27*	*4.42*	*4.61*	*4.96*	*4.11*	*3.75*

Heavy Melting Steel Scrap Composite Price

(Average of Pittsburgh, Chicago and Philadelphia Quotations, per Gross Ton)

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$14.02	$10.29	$10.27	$16.46	$21.73	$29.93	$17.77	$25.13	$15.04	$12.45	$20.22	$19.15	$20.08	$16.97	$15.17	$13.70
February	13.06	11.39	10.39	16.10	21.35	29.92	14.75	26.00	15.21	12.46	21.46	19.21	18.27	15.50	14.58	13.71
March	13.10	11.10	10.78	17.28	23.60	29.58	14.52	25.50	13.17	13.46	24.79	17.56	16.92	15.83	14.65	13.65
April	13.39	10.83	10.61	17.42	26.63	28.47	15.79	24.42	11.63	14.71	24.00	15.20	15.48	15.27	14.71	13.81
May	12.30	10.60	10.79	16.47	27.63	28.79	15.06	23.71	12.20	15.67	20.77	14.71	15.46	14.35	13.95	13.90
June	11.60	10.57	10.78	15.25	37.21	28.87	16.54	23.47	11.47	15.52	18.94	14.88	16.09	14.40	13.60	13.52
July	11.42	10.50	11.65	15.19	36.00	29.00	19.13	24.21	11.00	15.92	17.23	16.00	16.46	15.42	13.48	13.13
August	11.46	10.42	13.00	15.35	31.30	29.00	20.25	25.88	11.57	16.30	16.58	16.58	17.23	15.88	13.80	13.75
September	11.35	10.30	13.79	15.67	31.50	29.00	18.87	26.53	12.15	18.33	16.98	17.20	17.39	16.25	13.92	14.75
October	11.00	9.71	13.62	16.90	26.60	29.00	18.67	23.73	12.88	19.20	15.15	17.08	17.08	15.58	13.48	15.85
November	10.39	9.13	14.63	20.40	27.83	28.50	20.50	20.00	12.73	18.02	15.13	18.17	17.63	15.25	13.18	15.73
December	9.97	9.50	16.20	24.13	28.87	25.00	22.77	15.92	12.29	17.94	17.37	20.08	17.39	15.08	13.48	15.92
Average	*11.92*	*10.36*	*12.21*	*17.22*	*28.35*	*28.76*	*17.89*	*23.71*	*12.61*	*15.83*	*19.05*	*17.15*	*17.12*	*15.48*	*14.00*	*14.29*

Scrap Prices at Pittsburgh, per Gross Ton

Heavy Melting Steel

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$14.95	$10.90	$11.63	$17.50	$22.60	$30.00	$19.00	$26.30	$15.50	$14.30	$21.80	$21.38	$21.50	$18.63	$16.88	$15.10
February	14.19	12.62	11.63	17.06	21.75	30.00	14.75	27.75	16.00	14.00	23.25	20.88	19.50	17.50	16.13	14.94
March	14.19	12.12	12.00	18.45	23.25	30.00	14.00	27.25	14.00	15.13	25.38	19.38	18.50	17.55	16.55	14.81
April	14.19	12.00	11.81	17.81	28.00	28.50	15.20	26.00	12.63	16.38	25.88	16.20	17.00	16.63	16.50	15.31
May	13.55	12.00	11.75	16.95	28.80	28.50	14.75	25.00	13.30	17.30	22.80	15.63	16.75	15.69	15.40	15.25
June	12.62	12.00	11.75	15.88	41.00	28.62	17.12	25.00	12.69	17.00	21.13	16.00	17.30	15.75	14.81	14.56
July	12.40	12.00	12.31	16.31	39.00	29.00	19.70	26.00	12.00	17.38	18.10	17.50	18.00	16.81	15.00	14.10
August	12.37	11.50	13.81	16.05	32.83	29.00	21.00	28.13	12.70	17.75	17.75	17.50	18.88	17.50	15.40	15.50
September	12.25	11.31	14.30	16.19	33.25	29.00	19.20	29.00	13.63	20.13	17.88	18.10	18.70	17.88	15.50	16.56
October	11.85	10.85	14.38	18.25	28.80	29.00	19.00	27.75	14.13	21.40	15.70	18.50	18.50	17.25	14.75	17.60
November	11.44	10.00	15.88	21.20	29.50	28.87	22.25	23.50	14.30	20.50	16.13	19.63	19.50	17.20	14.25	17.19
December	11.08	10.75	17.45	26.00	30.00	26.87	24.25	17.20	14.25	20.13	18.75	21.40	19.10	16.75	14.88	17.85
Average	*12.92*	*11.50*	*13.23*	*18.14*	*29.90*	*28.95*	*18.35*	*25.74*	*13.76*	*17.62*	*20.38*	*18.51*	*18.60*	*17.10*	*15.50*	*15.73*

No. 1 Cast Cupola Scrap

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	$25.00	$16.30	$23.30	$21.00	$19.63	$17.50	$16.00	$14.50
Feb.	22.75	16.00	24.75	21.38	20.13	17.00	15.56	14.50
March	21.20	15.94	26.75	20.25	18.60	17.00	15.80	14.50
April	18.00	16.88	27.75	18.50	17.75	16.50	16.00	14.50
May	18.00	18.50	26.30	17.88	17.50	16.50	15.70	14.50
June	16.63	18.75	24.13	17.25	17.10	15.90	15.13	14.25
July	16.00	19.00	21.10	17.80	17.00	15.75	15.00	14.25
Aug.	16.20	19.00	21.38	18.00	17.50	16.80	15.00	14.50
Sept.	16.88	22.13	21.75	18.00	17.40	16.50	15.00	14.94
Oct.	17.50	24.90	19.50	18.00	17.39	16.00	14.75	15.40
Nov.	17.10	23.13	18.63	18.13	18.00	16.30	14.35	15.00
Dec.	16.13	22.38	20.00	19.10	17.70	16.00	14.38	14.50
Aver.	*18.45*	*19.33*	*22.95*	*18.77*	*17.98*	*16.48*	*15.22*	*14.61*

Compressed Sheets

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	$13.00	$11.80	$20.50	$18.88	$20.00	$17.63	$15.50	$14.15
Feb.	13.00	12.00	21.75	19.63	18.00	16.13	15.06	14.06
March	12.00	13.13	23.75	17.50	17.35	15.60	15.45	14.56
April	10.50	14.63	24.75	14.60	15.63	15.25	15.56	14.94
May	10.80	15.10	24.30	13.75	15.46	14.75	14.40	14.90
June	10.13	15.13	19.88	14.38	16.30	14.60	13.75	14.25
July	9.38	15.50	16.90	15.70	16.63	15.50	14.31	13.60
Aug.	10.00	16.10	16.13	16.00	17.39	16.40	14.45	14.75
Sept.	10.06	17.88	16.00	16.55	17.40	16.50	14.50	16.39
Oct.	12.00	19.50	14.30	16.50	17.39	15.63	14.50	17.15
Nov.	12.00	19.50	14.25	17.75	18.00	16.00	13.70	17.00
Dec.	11.69	19.38	16.50	19.40	18.00	15.56	13.94	17.70
Aver.	*11.22*	*15.80*	*19.08*	*16.72*	*17.27*	*15.80*	*14.59*	*15.29*

Machine Shop Turnings

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	$10.00	$9.60	$16.90	$15.75	$17.50	$14.30	$12.00	$10.80
Feb.	10.00	9.56	18.50	16.13	15.88	13.63	11.38	10.88
March	9.40	10.50	20.38	14.50	14.20	13.35	12.00	10.25
April	8.13	11.88	20.50	12.45	13.39	12.00	12.63	10.44
May	8.70	13.30	19.20	11.88	12.25	11.00	11.30	10.20
June	7.56	13.32	17.19	13.00	13.05	11.00	10.50	9.00
July	7.00	14.00	12.10	13.50	13.63	11.38	11.50	9.10
Aug.	7.85	14.00	11.44	14.13	15.00	12.80	11.80	9.88
Sept.	9.06	14.75	12.88	14.40	14.75	13.06	11.63	11.13
Oct.	9.56	16.20	11.60	14.25	14.39	12.06	11.50	11.10
Nov.	9.85	16.63	11.63	15.94	15.00	11.90	11.10	11.00
Dec.	8.88	15.63	13.75	17.20	14.30	11.56	11.00	11.10
Aver.	*8.83*	*13.28*	*15.51*	*14.43*	*14.44*	*12.34*	*11.53*	*10.41*

Cast Iron Borings

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	$13.00	$10.90	$18.40	$16.94	$17.50	$14.88	$12.50	$11.30
Feb.	12.00	11.06	19.50	16.88	15.88	14.13	12.13	11.00
March	11.45	11.94	21.13	15.38	14.10	13.30	12.50	10.50
April	9.38	13.38	21.88	13.00	13.39	12.50	12.38	11.00
May	9.70	14.10	20.20	12.75	12.50	11.75	11.10	10.90
June	8.38	14.63	17.88	14.00	13.05	11.90	10.50	10.39
July	7.63	16.00	15.20	13.80	13.63	12.38	10.63	10.00
Aug.	8.30	15.70	13.88	14.75	15.00	12.75	11.00	10.75
Sept.	9.00	17.00	15.63	14.90	14.75	12.94	11.00	12.13
Oct.	10.13	18.60	13.50	15.00	14.39	12.50	11.00	12.50
Nov.	10.40	17.85	12.75	15.13	15.00	12.90	11.00	12.13
Dec.	9.25	17.50	14.88	16.70	14.90	12.13	11.13	12.00
Aver.	*9.88*	*14.89*	*17.07*	*14.94*	*14.51*	*12.84*	*11.57*	*11.22*

Low-Phosphorus Scrap, at Pittsburgh; Billet and Bloom Crops; Per Gross Ton

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	$24.00	$17.60	$25.30	$23.60	$26.50	$24.00	$21.00	$18.50
Feb.	23.75	17.13	27.50	25.13	24.75	22.25	20.25	18.50
March	21.60	17.38	32.00	24.00	23.30	22.00	20.30	18.50
April	18.63	18.88	32.25	19.40	22.13	21.13	21.00	18.50
May	18.10	20.00	28.60	19.50	21.63	20.00	20.00	18.60
June	16.88	20.00	25.88	20.13	22.00	20.00	19.25	19.00
July	15.88	20.13	22.00	20.90	22.00	20.75	19.00	19.00
Aug.	16.50	21.20	23.50	21.88	22.25	21.00	19.00	19.13
Sept.	17.25	24.25	24.38	22.60	23.00	21.67	20.00	19.88
Oct.	17.50	25.00	21.90	23.00	23.13	20.50	19.25	20.20
Nov.	17.30	24.00	20.50	23.25	24.00	20.60	18.30	20.50
Dec.	17.00	24.00	21.75	25.13	24.00	21.13	18.50	20.80
Aver.	*18.70*	*20.80*	*25.46*	*22.39*	*23.22*	*21.25*	*19.65*	*19.26*

No 1 Railroad Cast Scrap at Cincinnati

(Per Net Ton)

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	$16.25	$12.00	$17.20	$17.25	$17.38	$15.75	$14.00	$12.00
Feb.	15.50	11.63	19.50	17.75	15.88	15.00	13.00	12.00
March	13.90	12.00	21.75	16.25	15.50	14.50	13.00	11.60
April	13.50	13.25	22.00	14.00	15.13	14.10	13.00	11.60
May	13.50	14.00	20.60	13.00	15.00	13.50	13.00	11.43
June	12.75	14.00	18.00	13.38	15.90	13.63	13.00	11.39
July	11.00	14.00	16.70	14.50	16.00	14.50	13.00	11.39
Aug.	11.00	14.40	16.25	14.50	15.63	14.75	13.00	11.39
Sept.	12.00	16.13	16.88	15.30	15.50	15.00	13.00	11.60
Oct.	12.50	18.00	14.50	14.88	15.00	14.39	12.50	12.60
Nov.	12.50	17.13	13.66	15.63	15.88	14.00	12.25	13.17
Dec.	12.00	16.63	15.00	16.38	16.00	14.00	12.00	13.35
Aver.	*13.03*	*14.43*	*17.67*	*15.23*	*15.73*	*14.42*	*12.90*	*11.96*

No. 1 Machinery Cast Scrap at Cincinnati

(Per Net Ton)

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	$17.75	$14.00	$20.39	$20.50	$20.12	$19.75	$17.00	$14.30
Feb.	15.50	13.63	21.75	21.50	19.12	19.39	16.00	14.30
March	13.90	14.05	23.65	20.00	18.35	19.00	16.00	13.85
April	13.50	15.50	24.75	18.00	17.75	17.80	16.00	13.85
May	13.50	16.25	24.05	16.75	17.75	17.00	15.60	13.65
June	13.10	16.25	22.13	17.13	18.15	17.00	15.50	13.60
July	12.00	16.25	20.25	18.25	18.25	17.00	15.50	13.55
Aug.	12.00	17.45	19.05	18.25	19.00	17.63	15.50	13.40
Sept.	12.80	19.88	19.38	18.13	19.25	18.00	15.50	14.20
Oct.	14.00	21.25	18.00	17.68	19.00	17.39	15.50	15.65
Nov.	14.00	20.85	16.85	18.40	20.12	17.00	14.50	16.70
Dec.	14.00	20.75	18.00	18.75	20.00	17.00	14.00	16.60
Aver.	*13.84*	*17.17*	*20.69*	*18.69*	*18.94*	*17.83*	*15.55*	*14.47*

Scrap Prices at Chicago

Heavy Melting Steel, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$12.60	$9.35	$9.19	$15.50	$21.12	$30.00	$17.40	$24.50	$15.13	$11.45	$19.15	$17.69	$19.44	$15.12	$13.25	$12.50
February	12.13	10.50	9.56	14.75	21.50	30.25	15.06	25.00	15.13	11.38	20.33	17.88	17.69	13.88	13.00	12.69
March	12.08	9.81	9.63	16.50	23.70	29.87	15.63	24.25	12.50	12.38	23.50	16.56	16.45	13.95	12.90	12.63
April	12.50	9.80	9.15	16.50	27.00	28.75	16.41	23.75	11.00	13.75	22.50	14.10	14.81	13.19	13.13	12.63
May	11.25	9.69	9.37	15.94	28.70	28.80	15.62	23.00	11.50	14.95	19.70	13.75	15.00	12.13	12.35	12.95
June	10.44	9.75	9.44	14.80	36.50	29.00	16.69	22.95	10.81	14.56	17.88	13.63	15.75	12.45	12.00	12.63
July	10.50	9.75	10.40	14.50	33.00	29.00	19.40	24.13	10.00	15.25	17.05	14.90	15.60	14.19	12.06	12.30
August	10.56	9.69	11.56	15.25	29.60	29.00	20.88	25.35	10.60	15.95	16.00	15.50	16.44	14.00	12.30	12.75
September	10.06	9.19	11.75	16.06	31.25	29.00	19.10	24.81	11.31	18.13	16.31	16.40	16.35	14.00	12.25	12.94
October	10.00	8.50	11.75	16.81	26.00	29.00	18.25	21.50	12.44	18.40	14.15	16.13	16.00	13.00	11.69	13.95
November	9.56	8.06	13.44	20.60	27.60	28.50	20.88	18.45	12.25	17.31	14.00	17.13	16.00	13.00	11.50	14.50
December	9.00	8.43	15.63	23.00	28.37	22.75	21.80	16.20	11.13	17.25	16.06	18.95	15.75	13.00	12.06	14.50
Average	*10.89*	*9.38*	*10.91*	*16.68*	*27.86*	*28.66*	*18.09*	*22.82*	*11.98*	*15.06*	*18.05*	*16.05*	*16.27*	*13.49*	*12.39*	*13.09*

Old Steel Rerolling Rails, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$16.15	$11.10	$9.62	$17.06	$27.00	$35.00	$22.10	$34.25	$15.63	$12.10	$20.40	$18.88	$21.75	$17.50	$16.38	$14.90
February	15.50	11.81	9.87	17.06	27.00	35.00	16.44	34.38	15.50	12.00	21.75	20.13	19.25	16.63	15.94	15.00
March	15.00	11.56	10.25	17.65	28.00	34.75	16.38	32.30	13.30	13.31	24.63	19.13	17.86	16.50	15.60	14.44
April	14.63	11.50	10.25	18.00	32.62	33.50	17.55	32.13	12.63	14.50	23.75	16.30	16.00	16.13	16.00	13.81
May	13.95	11.31	10.25	17.38	36.50	34.00	17.75	31.75	13.40	15.70	21.70	15.00	16.88	15.19	15.20	14.40
June	12.69	11.50	10.25	15.85	46.90	34.00	18.75	32.65	12.94	15.25	19.25	14.81	17.85	15.45	14.75	14.81
July	12.25	11.50	10.30	15.25	45.19	34.00	25.15	35.00	12.25	16.13	18.00	15.50	17.44	17.19	14.88	14.75
August	12.12	11.50	12.25	15.80	39.20	34.00	29.50	38.00	12.45	16.90	17.50	16.19	19.00	17.10	15.30	15.13
September	12.25	10.75	13.35	17.06	39.75	34.00	26.80	38.13	13.13	19.38	17.38	17.30	19.25	17.39	15.19	15.38
October	12.15	10.00	13.31	18.81	34.75	34.00	27.19	33.44	14.00	20.30	15.80	17.06	18.88	16.63	14.88	16.50
November	12.00	9.50	14.44	24.50	34.80	33.50	31.25	22.90	13.80	18.38	15.06	18.19	19.44	16.50	14.50	16.63
December	11.33	9.50	16.63	28.63	35.25	27.50	31.90	16.90	12.63	17.75	17.00	20.36	19.10	16.19	14.63	16.50
Average	*13.34*	*10.96*	*11.73*	*18.59*	*35.58*	*33.60*	*23.40*	*31.90*	*13.47*	*15.98*	*19.35*	*17.40*	*18.56*	*16.53*	*15.27*	*15.23*

No. 1 Railroad Wrought, per Net Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$12.70	$8.70	$8.69	$15.88	$23.50	$31.25	$19.10	$26.00	$13.63	$10.50	$17.75	$15.31	$17.44	$13.50	$12.50	$11.10
February	12.19	9.50	8.87	14.94	23.75	31.25	15.13	27.00	13.50	10.44	18.38	15.38	16.13	12.88	12.31	11.13
March	12.13	9.06	9.00	16.20	25.90	30.75	15.88	27.10	11.60	11.50	20.88	14.06	14.60	12.95	12.10	11.00
April	12.38	9.00	8.65	17.00	30.35	30.20	16.05	27.25	10.00	12.13	20.00	12.75	13.00	12.44	12.39	11.25
May	11.25	9.00	8.94	16.50	32.60	29.75	15.69	26.38	10.40	12.90	17.60	12.00	13.44	10.94	11.35	11.60
June	10.56	9.00	9.00	15.20	41.00	29.75	16.87	25.25	9.63	12.69	15.50	11.56	14.65	11.60	11.00	11.31
July	10.55	9.00	9.15	14.94	37.75	29.75	18.60	24.88	9.25	13.63	14.60	12.80	14.19	13.31	11.39	10.85
August	10.62	8.94	10.44	15.30	33.70	29.75	20.75	24.75	10.45	14.75	14.25	13.75	16.00	13.50	11.70	11.06
September	10.19	8.37	11.00	16.38	35.50	29.75	19.50	23.88	11.50	17.62	15.63	14.80	15.50	13.50	11.25	11.31
October	9.60	7.87	11.19	17.50	28.75	30.36	19.38	20.25	13.00	17.75	13.20	14.25	14.38	12.81	10.19	12.60
November	9.00	7.56	12.94	21.00	30.90	28.68	22.88	16.85	12.20	15.81	12.50	15.50	15.63	12.50	9.60	13.13
December	8.50	7.90	15.38	25.13	31.25	24.62	24.10	14.60	10.44	15.13	15.00	16.81	13.95	12.00	10.44	13.25
Average	*10.81*	*8.66*	*10.27*	*17.16*	*31.25*	*29.66*	*18.66*	*23.68*	*11.30*	*13.74*	*16.27*	*14.08*	*14.91*	*12.66*	*11.35*	*11.67*

No. 1 Machinery Cast Scrap, per Net Ton

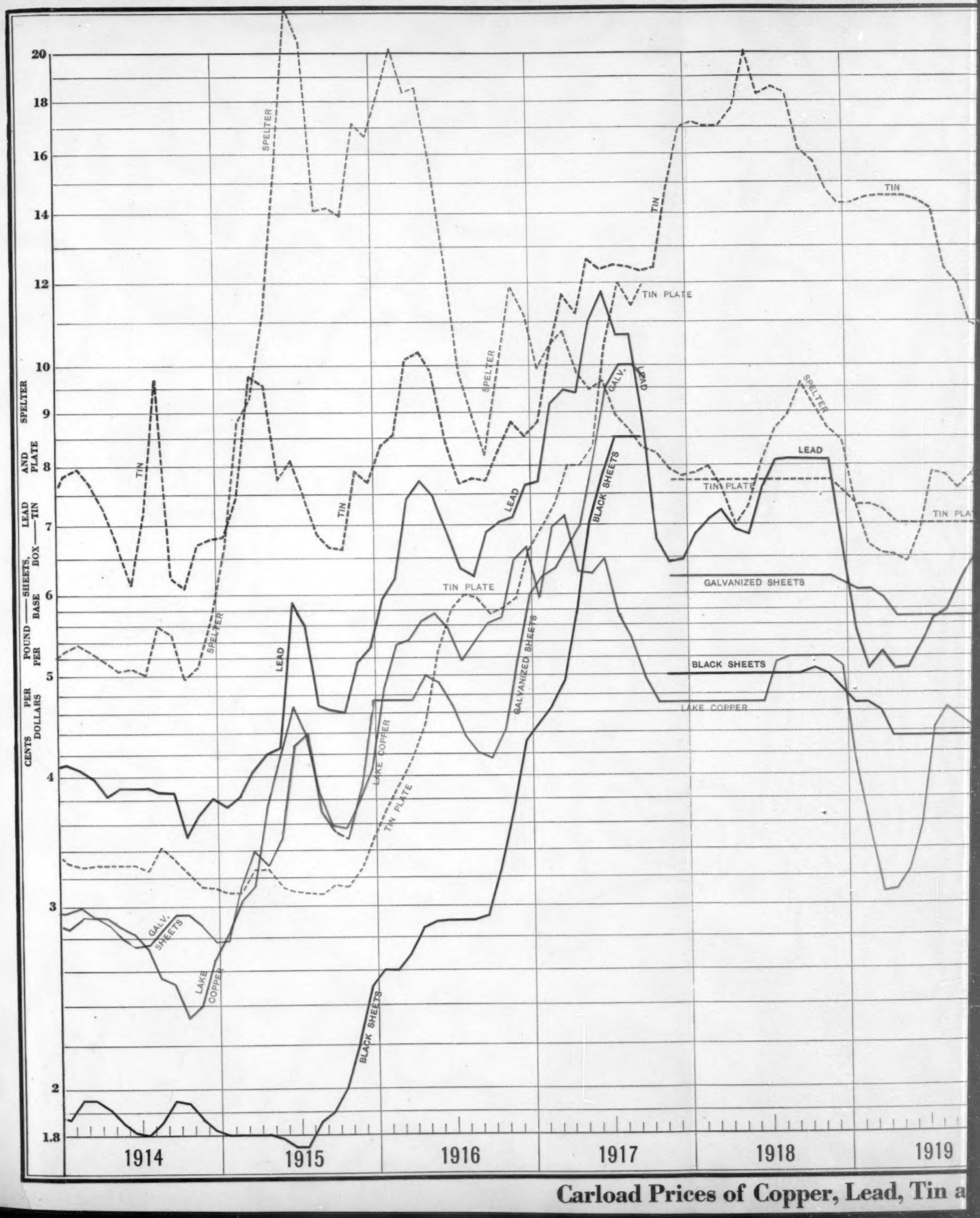
	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$12.90	$10.20	$9.19	$13.31	$15.50	$25.90	$22.95	$37.25	$17.25	$12.90	$21.60	$20.38	$19.88	$17.00	$16.50	$14.50
February	12.69	10.87	9.00	12.81	15.37	26.06	20.00	38.88	18.00	13.25	23.63	21.00	18.75	17.00	16.50	14.50
March	12.50	10.37	9.00	13.45	16.90	27.25	21.63	37.85	14.90	14.13	26.25	20.13	18.20	17.00	16.50	14.50
April	12.44	10.25	9.00	12.88	20.43	27.12	21.45	37.25	13.25	14.88	25.75	18.40	17.25	16.39	16.50	14.13
May	11.60	10.06	9.00	12.56	23.20	26.70	20.12	37.38	13.60	16.20	23.30	17.38	16.88	15.88	15.80	14.00
June	10.63	9.75	9.00	11.75	30.00	27.12	20.75	36.30	12.75	16.06	21.75	16.75	17.50	16.15	14.50	13.88
July	10.70	9.65	9.25	11.50	29.25	28.06	23.30	36.50	12.25	17.00	19.60	16.90	17.50	17.19	14.50	13.50
August	10.87	9.50	9.62	11.50	24.20	29.10	24.50	36.20	12.60	18.60	18.00	17.50	17.63	17.00	14.80	13.94
September	10.62	9.19	10.10	12.13	23.75	30.00	24.20	34.00	13.44	21.38	19.63	18.20	17.90	16.88	14.56	14.81
October	10.40	9.00	10.50	13.50	20.50	30.36	25.00	28.75	13.88	20.80	18.70	17.50	17.63	16.50	14.25	15.40
November	10.06	8.56	12.13	15.55	22.00	28.87	28.12	23.00	13.50	20.25	18.38	17.88	18.19	16.00	13.50	15.50
December	9.83	9.00	13.75	16.25	23.50	25.75	32.35	18.70	12.63	19.75	19.75	19.20	17.25	16.13	14.00	15.60
Average	*11.27*	*9.70*	*9.96*	*13.10*	*22.05*	*27.69*	*23.70*	*33.51*	*14.00*	*17.10*	*21.36*	*18.44*	*17.88*	*16.59*	*15.16*	*14.39*

Cast Borings, per Gross Ton

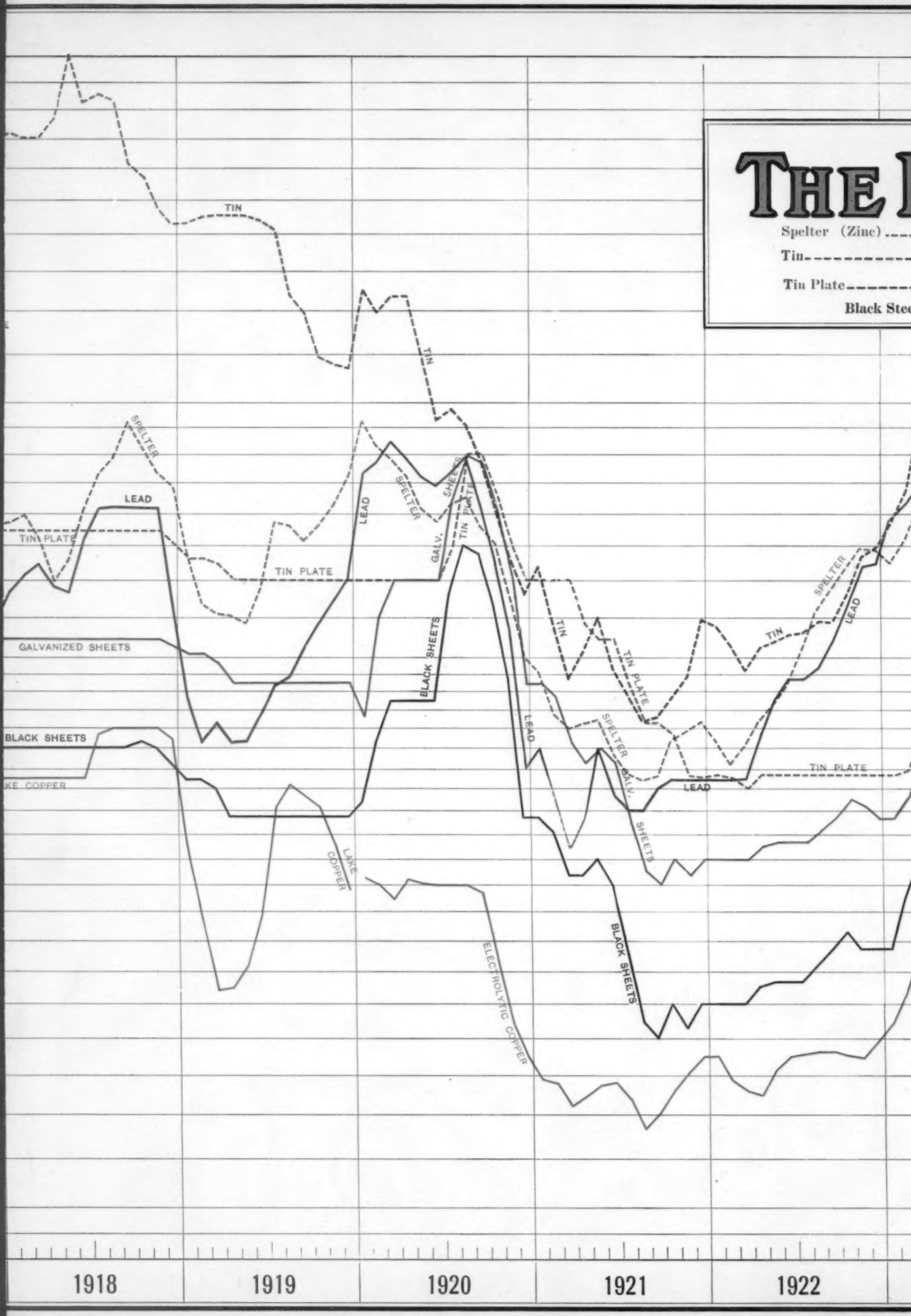
	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$10.08	$18.48	$12.54	$16.11	$10.92	$6.38	$15.57	$13.58	$15.56	$13.39	$10.06	$10.40
February	10.15	18.48	8.75	16.39	11.76	6.93	16.59	15.55	14.63	12.06	10.13	10.13
March	10.64	18.48	10.15	15.74	8.40	8.05	18.91	14.38	13.85	11.75	10.20	9.63
April	11.83	17.99	10.47	15.96	7.28	9.24	17.92	11.40	10.94	10.94	10.44	9.31
May	13.44	17.53	9.31	14.43	6.61	10.98	16.24	10.00	10.00	9.75	10.00	9.25
June	19.60	17.77	9.33	13.38	5.60	11.63	14.43	10.06	10.70	9.95	9.56	9.00
July	20.01	18.48	12.71	14.15	5.32	12.67	13.66	10.45	11.13	11.19	9.94	9.05
August	18.36	18.48	14.28	15.06	5.38	12.88	12.04	10.69	12.75	11.45	10.50	9.31
September	18.20	18.48	13.55	14.65	5.60	14.43	12.19	11.80	13.15	11.19	10.75	9.75
October	15.75	18.48	11.63	12.88	6.44	14.90	10.42	11.56	12.75	8.88	10.13	10.75
November	17.25	16.80	12.88	11.93	6.88	14.56	10.08	12.63	13.19	9.20	9.60	11.69
December	18.05	14.84	14.17	10.98	6.09	14.56	12.04	14.36	13.50	9.50	10.19	11.85
Average	*15.28*	*17.94*	*11.65*	*14.30*	*7.19*	*11.43*	*14.17*	*12.21*	*12.68*	*10.77*	*10.13*	*10.01*

Steel Knuckles and Couplers, per Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$25.20	$37.52	$24.51	$27.44	$16.39	$12.77	$24.98	$21.21	$22.88	$18.00	$16.25	$14.65
February	25.20	36.89	19.32	29.68	16.11	12.39	26.53	21.77	21.00	17.13	16.00	14.50
March	26.60	35.00	19.60	27.66	13.55	14.12	28.71	20.00	18.70	16.70	15.60	14.06
April	30.67	34.00	19.21	26.32	12.47	15.68	27.93	17.40	17.63	16.44	15.69	13.81
May	33.71	34.00	17.36	25.48	13.66	16.69	25.42	17.00	17.63	15.39	14.80	14.50
June	43.83	34.00	18.20	25.20	13.16	15.89	22.55	16.63	19.00	15.30	14.25	14.25
July	45.92	34.00	20.50	27.16	11.63	17.92	21.00	17.20	18.19	17.39	14.25	13.75
August	44.24	34.00	23.52	29.01	12.21	19.21	20.87	18.00	19.50	17.50	14.40	14.00
September	40.88	34.00	21.95	27.72	13.03	21.84	21.56	19.35	19.50	17.39	14.00	14.75
October	33.38	34.00	21.43	24.51	14.84	22.96	18.93	18.25	18.63	16.06	13.25	15.75
November	33.04	34.00	23.39	20.83	14.28	21.84	17.64	19.63	18.75	15.50	13.00	16.00
December	35.67	32.55	24.86	16.95	12.60	22.12	19.88	22.78	18.25	15.50	13.69	16.00
Average	*34.86*	*34.50*	*21.15*	*25.67*	*13.66*	*17.79*	*23.00*	*19.10*	*19.14*	*16.53*	*14.60*	*14.67*



Carload Prices of Copper, Lead, Tin a



es of Copper, Lead, Tin and Zinc in New York, and of Tin Plate and Black

E IRON AGE

(Zinc) ---------- Copper ——————

---------- Lead ——————

te---------- Galvanized Sheets ——————

Black Steel Sheets ——————

TIN
LEAD
SPELTER
TIN PLATE
GALV. SHEETS
BLACK SHEETS
ELECTROLYTIC COPPER

100 90 80 70 60 50 45 40 35 30 25 20 15 14 13 12 11 10 9

COPPER AND TIN — POUND PER CENTS

1923 1924 1925 1926 1927 1928

d Black and Galvanized Sheets in Pittsburgh

Railroad Malleable Scrap at Chicago, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$15.01	$10.36	$9.11	$15.47	$19.88	$30.02	$19.71	$32.48	$16.52	$12.77	$25.26	$20.93	$21.13	$18.00	$16.06	$13.60
February	14.56	11.63	8.96	14.93	19.39	30.02	16.65	33.53	17.36	12.81	26.75	21.77	20.00	17.56	16.06	13.50
March	14.56	10.71	8.89	15.62	20.10	31.24	18.07	31.92	15.46	13.87	28.56	21.00	19.10	17.60	16.00	12.63
April	14.77	10.25	8.96	15.56	22.81	31.64	17.70	30.95	13.59	15.68	28.00	19.30	17.50	17.39	15.88	12.75
May	13.55	10.24	9.12	15.05	26.10	32.82	17.08	29.68	14.11	16.80	25.54	18.13	17.63	16.50	14.45	13.00
June	12.39	10.08	9.11	13.14	35.41	33.04	17.92	28.73	12.88	16.73	24.08	16.88	18.00	16.60	13.50	12.69
July	11.87	10.08	9.97	13.03	33.73	33.28	20.94	30.24	12.53	17.51	22.51	17.00	17.88	17.81	13.63	12.50
August	11.63	9.95	11.20	12.60	33.26	34.01	22.96	32.20	13.44	19.04	20.59	17.38	19.13	17.75	14.50	12.88
September	11.41	9.24	11.48	12.88	34.44	34.01	21.22	30.95	14.63	23.67	21.71	18.20	19.10	17.39	13.69	14.39
October	10.81	8.85	11.48	13.87	28.28	34.01	21.35	26.32	15.12	24.42	19.60	18.13	18.50	16.50	13.13	15.30
November	10.43	8.68	12.75	17.92	28.67	32.68	25.89	21.78	14.67	23.11	18.91	19.00	19.19	16.50	12.55	15.88
December	10.08	8.90	15.40	20.16	30.63	25.48	28.78	16.80	12.81	22.40	20.23	20.28	18.30	16.00	12.81	16.90
Average	*12.59*	*9.91*	*10.53*	*15.02*	*27.72*	*31.85*	*20.85*	*28.80*	*14.43*	*18.23*	*23.48*	*19.00*	*18.79*	*17.13*	*14.36*	*13.84*

Old Cast Iron Carwheels at Chicago, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$16.95	$11.65	$9.94	$14.63	$18.87	$30.00	$25.90	$36.13	$21.00	$15.30	$26.70	$20.50	$21.38	$18.00	$15.31	$13.90
February	16.75	12.44	10.00	13.94	18.25	30.00	22.75	38.06	20.63	15.00	27.25	21.00	19.38	17.13	15.13	14.00
March	16.75	11.88	9.94	14.30	20.25	30.00	21.50	36.20	15.90	16.50	28.38	21.00	17.10	17.00	15.00	13.88
April	16.75	11.55	9.75	13.88	23.62	29.00	21.50	37.50	14.06	18.63	27.75	16.70	16.00	16.39	15.00	13.50
May	15.05	11.50	9.75	12.95	27.35	29.00	21.25	37.50	14.70	18.50	24.10	16.25	16.06	15.25	14.05	13.45
June	13.94	11.50	10.19	12.44	39.00	29.00	22.00	35.90	13.31	18.25	21.88	15.63	17.30	15.30	13.50	13.06
July	12.90	11.25	11.30	12.50	35.25	29.00	23.95	35.75	12.75	19.25	20.60	16.40	17.12	16.39	13.75	12.80
August	12.75	11.25	11.04	11.60	30.40	29.00	26.25	38.35	12.95	20.60	19.50	17.13	17.50	15.90	14.50	12.75
September	12.63	11.06	11.80	11.69	31.87	29.00	24.90	37.69	14.19	23.75	19.75	18.20	17.70	15.25	14.25	13.31
October	12.10	10.65	12.00	12.94	25.75	29.00	24.88	36.06	16.50	25.10	17.90	17.63	17.38	14.50	13.56	13.85
November	12.00	9.81	13.31	17.30	28.15	29.00	28.63	31.95	16.60	24.63	17.88	18.63	18.31	14.50	13.25	14.25
December	11.88	9.60	14.56	21.25	31.00	26.75	31.10	24.40	15.75	24.00	19.75	20.70	18.30	14.50	13.44	14.10
Average	*14.20*	*11.18*	*11.13*	*14.12*	*27.48*	*29.06*	*24.55*	*35.46*	*15.70*	*19.96*	*22.62*	*18.31*	*17.79*	*15.84*	*14.23*	*13.57*

Philadelphia Scrap Prices, Delivered Eastern Pennsylvania

Heavy Melting Steel, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$14.40	$10.40	$10.00	$16.38	$21.70	$30.00	$17.20	$24.75	$14.50	$11.60	$19.70	$18.20	$18.50	$17.00	$15.39	$13.50
February	12.87	11.00	10.00	16.50	20.63	30.00	14.75	25.62	14.25	12.00	20.75	18.38	17.63	15.88	14.63	13.50
March	13.25	11.31	10.80	16.90	23.50	29.00	14.19	25.20	13.00	12.78	25.25	16.75	15.90	16.00	14.50	13.50
April	13.34	10.95	11.00	17.88	24.88	28.00	15.50	24.12	11.25	14.00	23.63	15.30	14.63	16.00	14.50	13.50
May	12.10	10.63	11.25	16.60	25.40	29.00	15.00	23.37	11.80	14.75	19.80	14.75	14.63	15.25	14.10	13.50
June	11.75	10.50	11.10	15.31	34.13	29.00	16.12	22.60	11.25	15.00	17.88	15.00	15.10	14.70	14.00	13.39
July	11.35	10.30	12.06	14.94	35.20	29.00	18.90	22.62	11.00	15.00	16.60	15.40	15.63	14.63	13.39	13.00
August	11.43	10.19	13.75	14.75	31.88	29.00	19.37	25.00	11.40	15.20	16.00	16.75	16.38	16.20	13.70	13.00
September	11.62	10.69	15.00	14.75	30.25	29.00	18.62	25.62	11.50	16.88	16.75	17.10	17.20	16.88	14.00	14.75
October	11.15	9.95	14.75	15.63	25.00	29.00	19.10	22.75	12.06	17.80	15.40	16.63	16.75	16.50	14.00	16.00
November	10.19	9.25	14.65	20.13	26.00	28.00	20.62	19.00	11.88	16.25	15.25	17.75	17.38	15.50	13.80	15.50
December	10.00	9.40	15.81	23.75	28.20	25.00	22.50	15.25	11.50	16.38	16.75	20.10	17.50	15.50	13.50	15.40
Average	*11.96*	*10.38*	*12.51*	*16.96*	*27.23*	*28.67*	*17.66*	*22.99*	*12.12*	*14.80*	*18.65*	*16.84*	*16.44*	*15.84*	*14.13*	*14.05*

No. 1 Machinery Cast, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$14.50	$12.00	$12.00	$17.00	$20.20	$30.00	$23.80	$36.00	$23.25	$16.50	$23.20	$20.70	$20.13	$18.39	$17.00	$16.00
February	14.37	12.88	12.00	17.00	20.00	30.00	23.00	40.00	23.00	16.50	24.25	20.25	18.88	17.75	17.00	16.00
March	14.00	13.00	12.00	17.00	21.75	30.00	21.25	39.20	19.40	17.13	28.25	18.63	18.00	17.50	17.00	16.00
April	13.94	13.00	11.75	17.88	26.63	29.00	22.00	38.00	18.00	17.25	26.25	17.70	17.25	17.50	17.00	16.00
May	13.60	12.25	12.13	17.50	29.00	29.00	21.50	37.75	18.00	18.40	24.30	17.00	17.00	17.25	16.80	16.00
June	13.25	12.00	12.25	16.50	33.50	29.00	22.00	37.00	17.38	19.00	22.25	17.50	17.50	17.00	16.00	16.00
July	13.00	12.00	12.38	16.00	36.30	29.00	22.10	37.50	16.50	17.50	20.40	17.50	17.63	17.00	16.00	15.50
August	12.87	12.00	13.30	16.00	33.25	29.00	24.75	39.00	17.00	18.60	20.38	17.88	18.00	17.70	16.00	15.50
September	12.81	12.00	14.00	16.00	31.00	29.00	25.00	39.25	17.00	21.50	21.38	18.00	18.00	18.00	16.38	16.25
October	13.50	11.40	14.00	16.15	28.00	29.00	25.20	38.75	17.13	22.60	19.50	17.50	18.00	17.39	16.50	17.10
November	12.62	11.00	14.50	18.50	30.00	29.00	27.62	33.80	17.50	21.00	19.25	17.88	18.00	17.30	16.13	16.39
December	12.17	11.30	16.06	20.75	30.60	29.00	30.75	24.50	16.63	20.25	20.25	19.50	18.13	17.00	16.00	16.25
Average	*13.39*	*12.07*	*13.03*	*17.19*	*28.35*	*29.25*	*24.08*	*36.73*	*18.49*	*18.85*	*22.47*	*18.34*	*18.04*	*17.48*	*16.48*	*16.08*

No. 1 Railroad Wrought, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$16.10	$13.05	$12.00	$22.00	$26.60	$35.00	$24.20	$33.50	$20.00	$14.50	$22.10	$20.90	$20.88	$18.39	$17.00	$15.25
February	15.12	14.38	12.00	21.63	25.50	35	21.50	36.00	19.75	14.63	24.75	21.50	20.13	17.75	17.00	15.06
March	15.25	14.00	12.50	22.13	30.75	35.00	20.25	35.90	17.20	15.38	27.50	19.00	18.90	17.20	17.00	14.60
April	15.37	13.25	12.69	23.38	36.00	35.00	21.60	35.00	17.00	15.88	27.00	18.10	17.75	17.50	16.50	14.50
May	15.00	12.63	12.94	22.50	41.40	34.00	21.00	33.50	15.20	16.90	24.20	16.63	17.50	17.25	16.50	14.50
June	14.75	12.50	13.00	20.50	51.25	34.00	21.50	33.00	14.38	17.00	22.50	16.50	18.10	16.60	16.00	13.75
July	13.90	12.20	13.44	19.50	50.60	34.00	24.40	33.00	13.50	17.13	18.80	17.70	17.63	16.50	15.75	13.50
August	14.00	12.00	14.95	20.20	45.00	34.00	26.50	33.00	14.00	18.00	18.00	18.63	17.50	17.80	15.50	13.50
September	14.68	12.38	16.50	20.00	44.00	34.00	26.50	33.25	15.00	20.88	18.50	19.00	17.70	17.88	15.50	14.50
October	14.00	11.80	16.13	21.63	37.20	34.00	26.90	29.25	15.88	22.20	17.50	18.00	18.13	17.00	15.50	15.60
November	13.00	11.50	16.50	24.13	35.00	34.00	28.37	25.00	16.00	19.00	17.38	18.38	18.50	17.00	15.30	16.00
December	12.75	11.50	20.06	26.75	35.00	33.00	30.25	20.00	14.63	19.25	18.50	20.40	18.50	17.00	15.25	16.00
Average	*14.49*	*12.60*	*14.39*	*22.03*	*38.19*	*34.25*	*24.41*	*31.70*	*16.04*	*17.56*	*21.39*	*18.73*	*18.44*	*17.32*	*16.07*	*14.73*

Old Cast Iron Carwheels, per Gross Ton

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$16.20	$12.20	$11.00	$16.38	$21.50	$30.00	$24.60	$36.00	$25.00	$16.50	$22.30	$20.10	$19.50	$18.13	$16.38	$15.50
February	15.37	12.63	10.63	16.50	20.50	30.00	23.00	40.62	24.00	15.00	24.75	20.38	18.38	17.50	16.00	15.50
March	15.00	12.50	11.00	16.70	21.50	30.00	23.00	42.40	18.50	15.94	26.50	18.75	18.50	17.50	16.00	15.50
April	14.87	12.00	11.00	17.38	25.75	29.00	23.10	40.00	18.00	15.88	26.50	17.50	17.75	17.50	16.00	15.50
May	13.75	11.75	11.38	16.70	28.00	29.00	21.00	40.00	16.80	16.70	24.20	17.00	17.00	17.25	16.00	15.50
June	13.12	11.19	11.55	16.38	34.00	29.00	22.00	38.00	18.00	17.13	22.75	17.00	17.00	17.00	15.38	15.50
July	12.30	11.00	12.38	15.63	36.20	29.00	23.20	38.50	16.50	17.50	20.40	17.30	17.25	17.00	15.00	15.50
August	12.37	11.25	13.25	15.50	34.50	29.00	24.50	40.60	16.40	18.10	20.25	17.75	18.50	17.40	15.30	15.50
September	12.75	11.25	14.00	15.50	32.50	29.00	24.50	42.75	17.00	21.75	21.00	18.00	18.50	17.50	15.50	15.38
October	12.46	10.10	13.75	15.88	29.00	29.00	24.50	40.50	17.00	22.50	19.60	17.50	18.50	17.13	15.50	16.50
November	12.00	9.50	14.05	18.88	31.25	29.00	27.75	36.40	17.20	20.50	17.75	17.88	18.50	16.60	15.50	16.50
December	12.00	10.00	15.63	22.38	32.40	28.00	30.50	26.00	16.63	20.00	19.50	19.20	18.50	16.50	15.50	16.50
Average	*13.52*	*11.28*	*12.47*	*16.98*	*28.93*	*29.17*	*24.30*	*38.48*	*18.42*	*18.13*	*22.18*	*18.20*	*18.16*	*17.22*	*15.67*	*15.78*

Metals, Tin Plate and Galvanized Sheets for Sixteen Years

Copper at New York, Cents a Pound (Lake Copper through 1919; Electrolytic Copper, 1920 to Date)

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	16.98	14.85	14.02	24.39	29.73	23.50	20.48	19.27	12.95	13.55	14.52	12.46	14.73	13.84	12.99	13.85
February	15.55	15.00	15.21	26.85	34.90	23.50	17.86	19.02	12.84	12.92	15.34	12.73	14.49	14.00	12.69	13.82
March	15.05	14.79	15.75	27.10	35.85	23.50	15.46	18.50	12.19	12.68	16.84	13.52	14.06	13.86	13.08	13.90
April	15.67	14.75	18.90	28.27	31.67	23.50	15.55	19.19	12.49	12.61	16.81	13.21	13.30	13.69	12.81	14.13
May	15.91	14.40	21.00	28.88	31.42	23.50	16.18	19.05	12.79	13.13	15.54	12.76	13.34	13.60	12.65	14.19
June	15.42	14.12	23.38	27.82	32.46	23.50	17.95	19.00	12.88	13.62	14.74	12.35	13.41	13.64	12.37	14.50
July	14.78	13.70	21.98	25.84	28.78	25.80	22.07	19.00	12.46	13.71	14.39	12.39	13.95	13.91	12.51	14.50
August	15.86	12.85	19.33	26.95	27.24	26.00	23.16	19.00	11.70	13.74	13.87	13.26	14.48	14.19	13.00	14.50
September	16.77	12.66	17.97	28.03	24.90	26.00	22.68	18.70	12.01	13.75	13.36	12.97	14.42	14.05	12.93	14.70
October	16.85	11.73	17.89	28.48	23.50	26.00	22.13	16.56	12.67	13.66	12.58	12.96	14.29	13.88	12.98	15.16
November	16.16	12.00	18.92	32.32	23.50	26.00	20.69	14.63	13.07	13.62	12.76	13.59	14.36	13.59	13.34	15.75
December	14.88	13.35	20.24	33.38	23.50	25.40	18.90	13.63	13.55	14.00	12.88	14.23	13.82	13.31	13.79	15.75
Average	*15.82*	*13.68*	*18.72*	*28.19*	*28.95*	*24.68*	*19.43*	*17.96*	*12.63*	*13.42*	*14.47*	*13.04*	*14.05*	*13.80*	*12.93*	*14.56*

Spelter (Zinc) at New York, Cents a Pound

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	7.15	5.29	6.59	18.19	9.94	7.88	7.38	9.62	5.83	5.06	7.28	6.78	8.10	8.75	7.03	6.00
February	6.45	5.40	8.84	20.13	10.48	7.99	6.70	9.14	5.36	4.85	7.58	7.11	7.86	8.16	7.04	5.90
March	6.26	5.28	9.29	18.40	10.77	7.64	6.52	8.93	5.20	5.00	8.19	6.85	7.68	7.69	7.06	5.98
April	5.77	5.18	11.22	18.58	9.85	7.01	6.51	8.63	5.24	5.25	7.65	6.49	7.35	7.36	6.69	6.11
May	5.47	5.06	16.14	15.86	9.46	7.32	6.46	8.08	5.28	5.45	6.99	6.13	7.30	7.16	6.43	6.37
June	5.18	5.09	22.18	12.75	9.62	8.01	6.93	7.92	4.95	5.69	6.40	6.14	7.35	7.47	6.57	6.50
July	5.38	5.02	20.58	9.83	8.95	8.69	7.90	8.18	4.77	6.12	6.43	6.25	7.60	7.76	6.58	6.55
August	5.75	5.60	14.11	8.98	8.69	8.96	7.84	8.31	4.69	6.59	6.68	6.53	7.55	7.69	6.70	6.59
September	5.82	5.50	14.16	8.22	8.34	9.60	7.57	7.82	4.74	6.91	6.81	6.54	8.12	7.76	6.56	6.60
October	5.42	4.97	13.96	9.98	8.24	9.11	7.83	7.51	5.10	7.20	6.66	6.67	8.65	7.66	6.35	6.60
November	5.29	5.12	17.15	11.90	7.95	8.70	8.14	6.84	5.18	7.48	6.70	7.14	9.04	7.56	6.09	6.62
December	5.18	5.71	16.69	11.13	7.84	8.45	8.59	6.00	5.25	7.46	6.60	7.73	8.97	7.39	6.15	6.70
Average	*5.76*	*5.27*	*14.24*	*13.66*	*9.18*	*8.28*	*7.36*	*8.08*	*5.13*	*6.09*	*7.00*	*6.70*	*7.96*	*7.70*	*6.60*	*6.39*

Lead, at New York, Cents a Pound

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	4.35	4.11	3.74	5.93	7.69	6.87	5.56	8.67	5.00	4.70	7.85	8.31	10.26	9.25	7.55	6.50
February	4.35	4.06	3.82	6.23	9.13	7.04	5.05	8.88	4.54	4.70	8.14	9.01	9.38	9.08	7.40	6.34
March	4.35	3.97	4.04	7.43	9.47	7.24	5.23	9.21	4.08	4.71	8.47	9.23	8.90	8.46	7.57	6.00
April	4.40	3.82	4.20	7.73	9.43	6.95	5.03	8.95	4.33	5.13	8.19	8.19	8.01	7.91	7.10	6.10
May	4.37	3.90	4.25	7.45	11.00	6.88	5.05	8.55	4.99	5.51	7.39	7.27	8.08	7.75	6.60	6.13
June	4.35	3.90	5.89	6.87	11.68	7.55	5.34	8.48	4.56	5.73	7.14	7.08	8.35	8.08	6.42	6.30
July	4.37	3.90	5.59	6.34	10.72	8.04	5.65	8.67	4.40	5.75	6.28	7.15	8.33	8.60	6.33	6.22
August	4.64	3.87	4.68	6.26	10.72	8.05	5.77	8.98	4.40	5.88	6.74	8.02	9.52	8.96	6.69	6.25
September	4.73	3.86	4.62	6.88	8.84	8.05	6.12	8.11	4.60	6.20	7.06	8.09	9.60	8.80	6.30	6.45
October	4.52	3.52	4.60	7.00	6.77	8.05	6.45	7.24	4.70	6.67	6.84	8.31	9.62	8.40	6.25	6.50
November	4.33	3.68	5.16	7.13	6.44	8.05	6.76	6.33	4.70	7.20	6.87	8.96	9.84	8.00	6.27	6.39
December	4.06	3.80	5.33	7.60	6.48	6.71	7.03	4.80	4.70	7.28	7.61	9.61	9.36	7.87	6.52	6.49
Average	*4.40*	*3.87*	*4.66*	*6.90*	*9.03*	*7.46*	*5.76*	*8.07*	*4.58*	*5.79*	*7.39*	*8.27*	*9.10*	*8.39*	*6.75*	*6.31*

Straits Tin, at New York, Cents a Pound

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	50.34	39.12	34.13	41.76	44.10	85.13	71.50	62.74	35.94	32.03	39.16	48.70	58.26	62.20	66.43	55.56
February	48.71	39.82	37.25	42.60	51.47	85.00	72.45	59.87	32.16	30.74	41.98	53.41	57.09	63.65	69.05	52.47
March	46.93	38.03	48.73	50.53	58.38	85.00	72.50	61.93	28.79	29.14	43.61	55.03	53.67	64.47	69.23	52.11
April	49.04	36.10	47.64	51.51	55.82	88.53	72.50	62.12	30.36	30.58	45.84	50.02	52.27	63.35	67.88	52.28
May	49.06	33.21	38.79	49.14	63.21	100.00	72.50	54.99	32.50	30.92	43.11	44.08	54.65	62.36	67.47	51.53
June	45.01	30.60	40.26	42.07	61.93	91.00	71.83	48.34	29.39	31.46	40.97	42.74	55.93	60.63	67.42	47.92
July	41.32	35.65	37.38	38.25	62.61	93.00	70.11	49.29	27.69	31.67	38.47	46.29	58.05	62.98	64.01	47.01
August	41.63	48.34	34.37	38.88	62.53	91.33	62.20	47.60	26.35	32.36	39.33	51.89	58.12	65.17	64.41	47.97
September	42.63	31.13	33.13	38.65	61.54	80.40	59.79	44.43	26.70	32.36	41.60	49.24	58.27	68.89	61.43	48.06
October	40.38	30.25	33.05	41.10	62.24	78.82	54.82	40.47	27.70	34.61	41.80	50.60	62.24	70.36	58.49	48.99
November	39.75	33.28	39.50	44.12	74.18	73.67	54.17	36.97	28.93	36.76	44.09	54.25	63.30	70.75	57.49	50.76
December	37.12	34.01	38.53	42.55	84.74	71.51	53.80	34.04	32.41	37.48	47.16	56.03	62.94	68.68	58.54	50.25
Average	*44.33*	*35.80*	*38.56*	*43.43*	*61.90*	*85.28*	*65.68*	*50.23*	*29.91*	*32.51*	*42.68*	*50.19*	*57.90*	*64.29*	*64.32*	*50.39*

Tin Plate, at Pittsburgh, Dollars a Base Box

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	$3.60	$3.32	$3.10	$3.75	$7.00	$7.75	$7.35	$7.00	$7.00	$4.75	$4.75	$5.50	$5.50	$5.50	$5.50	$5.25
February	3.60	3.29	3.10	3.96	7.38	7.75	7.35	7.00	7.00	4.71	4.80	5.50	5.50	5.50	5.50	5.25
March	3.60	3.30	3.25	4.19	8.00	7.75	7.26	7.00	7.00	4.60	5.23	5.50	5.50	5.50	5.50	5.25
April	3.60	3.30	3.25	4.50	8.00	7.75	7.00	7.00	6.44	4.75	6.00	5.50	5.50	5.50	5.50	5.25
May	3.60	3.30	3.15	5.30	8.40	7.75	7.00	7.00	6.25	4.75	5.70	5.50	5.50	5.50	5.50	5.25
June	3.60	3.30	3.11	5.81	10.50	7.75	7.00	7.00	6.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25
July	3.60	3.27	3.10	6.00	12.00	7.75	7.00	7.50	5.69	4.75	5.50	5.50	5.50	5.50	5.50	5.25
August	3.55	3.41	3.10	5.95	11.40	7.75	7.00	9.00	5.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25
September	3.50	3.35	3.15	5.75	12.00	7.75	7.00	9.00	5.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25
October	3.50	3.24	3.15	5.81	....	7.75	7.00	8.33	5.13	4.75	5.50	5.50	5.50	5.50	5.50	5.25
November	3.40	3.15	3.28	5.97	7.75	7.75	7.00	7.50	4.75	4.75	5.50	5.50	5.50	5.50	5.50	5.25
December	3.40	3.13	3.52	6.63	7.75	7.55	7.00	7.00	4.73	4.75	5.50	5.50	5.50	5.50	5.25	5.25
Average	*3.55*	*3.28*	*3.19*	*5.30*	*9.11*	*7.73*	*7.08*	*7.53*	*5.90*	*4.73*	*5.42*	*5.50*	*5.50*	*5.50*	*5.48*	*5.25*

No. 28 Gage Galvanized Sheets, at Pittsburgh, Cents a Pound

(While No. 24 gage was made the base in 1926, this table has been continued at No. 28 gage, to preserve comparisons with past years.)

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
January	3.46	2.87	2.79	4.75	6.25	6.25	6.05	5.33	5.70	4.00	4.35	4.98	4.75	4.60	4.28	4.15
February	3.50	2.95	3.16	4.75	6.38	6.25	6.05	6.50	5.56	4.00	4.54	5.00	4.75	4.53	4.21	4.15
March	3.50	2.95	3.40	4.75	6.69	6.25	5.96	7.00	5.05	4.00	4.93	4.93	4.62	4.50	4.15	4.15
April	3.50	2.91	3.29	5.00	7.00	6.25	5.70	7.00	4.88	4.11	5.25	4.88	4.45	4.50	4.13	4.15
May	3.42	2.80	3.50	4.94	8.20	6.25	5.70	7.00	5.00	4.15	5.20	4.80	4.29	4.43	4.22	4.08
June	3.38	2.75	4.28	4.69	9.50	6.25	5.70	7.00	4.88	4.15	5.00	4.76	4.21	4.28	4.35	4.00
July	3.33	2.75	4.40	4.38	10.00	6.25	5.70	8.25	4.31	4.15	5.00	4.56	4.19	4.24	4.35	3.96
August	3.24	2.85	3.71	4.21	10.00	6.25	5.70	9.00	3.90	4.23	5.00	4.55	4.20	4.23	4.35	3.90
September	3.16	2.95	3.56	4.18	9.75	6.25	5.70	8.88	3.81	4.35	5.00	4.60	4.20	4.33	4.35	3.90
October	3.08	2.95	3.50	4.41	....	6.25	5.70	8.18	4.00	4.50	5.00	4.60	4.23	4.35	4.26	4.00
November	2.98	2.88	3.89	5.18	6.25	6.25	5.70	7.04	3.86	4.43	4.93	4.60	4.50	4.35	4.16	4.00
December	2.90	2.78	4.75	6.00	6.25	6.15	5.70	5.70	4.00	4.35	4.89	4.72	4.60	4.35	4.13	4.08
Average	*3.29*	*2.87*	*3.69*	*4.77*	*7.84*	*6.24*	*5.78*	*7.24*	*4.58*	*4.20*	*4.92*	*4.75*	*4.42*	*4.39*	*4.25*	*4.04*

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The Helm Often Called for More Than One Man— When Clipper Ships Ruled the Waves

Spars piled high with billowing canvas—bowsprit pointing skyward as two, perhaps three, brawny sailormen fought the helm to hold the vessel to her course—the gallant clipper ship was a pulse-quickening sight. Today the great ocean greyhounds are piloted by machinery—a "metal mike" on the bridge relieves a crew on the quarterdeck.

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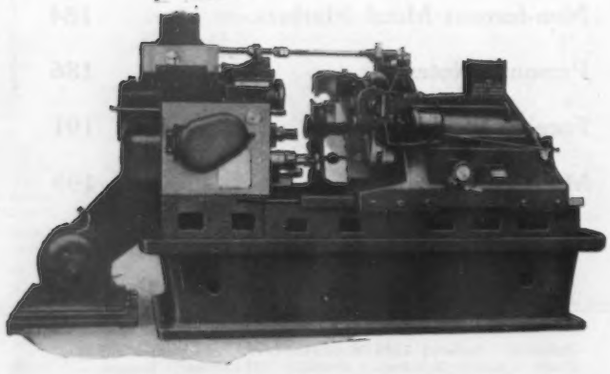

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In convenience it is unequalled. Loading takes place while the tools are cutting; spindles are individually speeded by change gears, giving selective reaming, drilling and threading speeds. A new job does not demand new cams—merely change the chuck jaws and re-set the tools.

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Automatic Chucking Machines

THE IRON AGE

New York, January 10, 1929

ESTABLISHED 1855 VOL. 123, No. 2

Economies Feature Enameling Plant

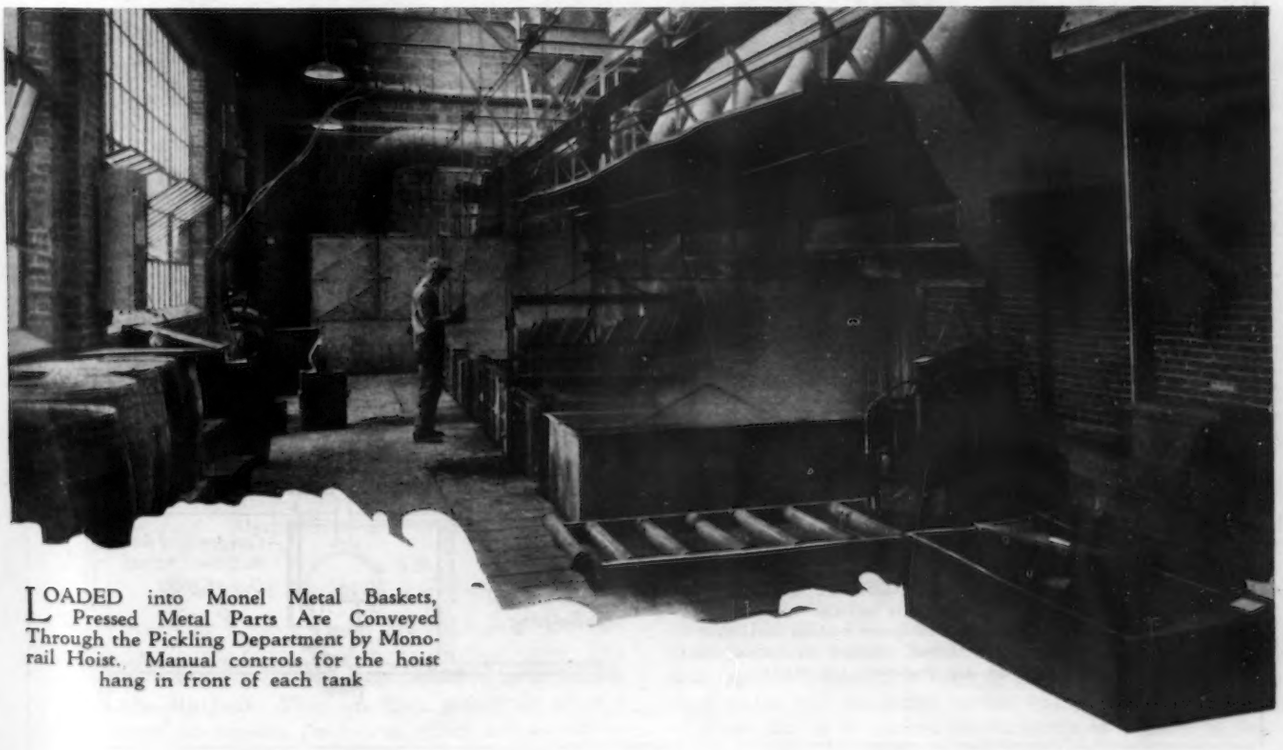
Overhead Distribution of Enamel, Recovery of Waste Furnace Heat for Drying and Direct Routing of Work Yield Savings

BY ROGERS A. FISKE*

OVERHEAD distribution of enamel, recovery of waste furnace heat for drying and direct routing of parts in process are outstanding features of an enameling plant recently constructed by the George D. Roper Corporation, Rockford, Ill. This unit is the second to be built on a site where eventually all departments for the manufacture of gas ranges will be located. The new building was laid out, therefore, not only to coordinate, from a materials-flow standpoint, with an adjacent foundry, but also to fit in with future units, such as pressed metal, assembly, inspection and shipping departments. Frank D. Chase, Inc., architect and engineer, Chicago, designed the enameling plant and prepared plans for the future units.

The foundry is separated from the enameling plant by a standard-gage switch track. Cast parts are delivered to a sand blast room, located in the northwest corner of the enameling building. Plans call for the erection of a castings storage building between the foundry and the sand blast department. Sand is unloaded from cars spotted on the switch track. Castings are passed through either a barrel-type or a cabinet-type sand blast machine. Dust is removed from the sand blast equipment by a motor-driven fan, which draws through a separator into a dust arrester outside of the building. Exhaust air from the

*Western editor of THE IRON AGE.



LOADED into Monel Metal Baskets, Pressed Metal Parts Are Conveyed Through the Pickling Department by Monorail Hoist. Manual controls for the hoist hang in front of each tank

arresters may be returned to the sand blast room if weather conditions make it desirable.

From the sand blast department the castings are moved to an iron storeroom, which is heated with steam to 120 deg. Fahr. This room is essentially a dead air storage space, having a single entrance and a single exit door, which are kept closed when castings are not being trucked through them. By storing castings in dry heated air, oxidation of the newly cleaned surfaces is prevented during the interval between sand blasting and applying the first coating of enamel.

As castings are called for by the enameling schedule, they are trucked from the iron storage room to stations opposite four iron spray booths, which are located in a straight line with the iron burning furnace. At each booth is a waste heat dryer, so that immediately after applying enamel the part can be dried, preventing the formation of a rust film beneath the enamel coat.

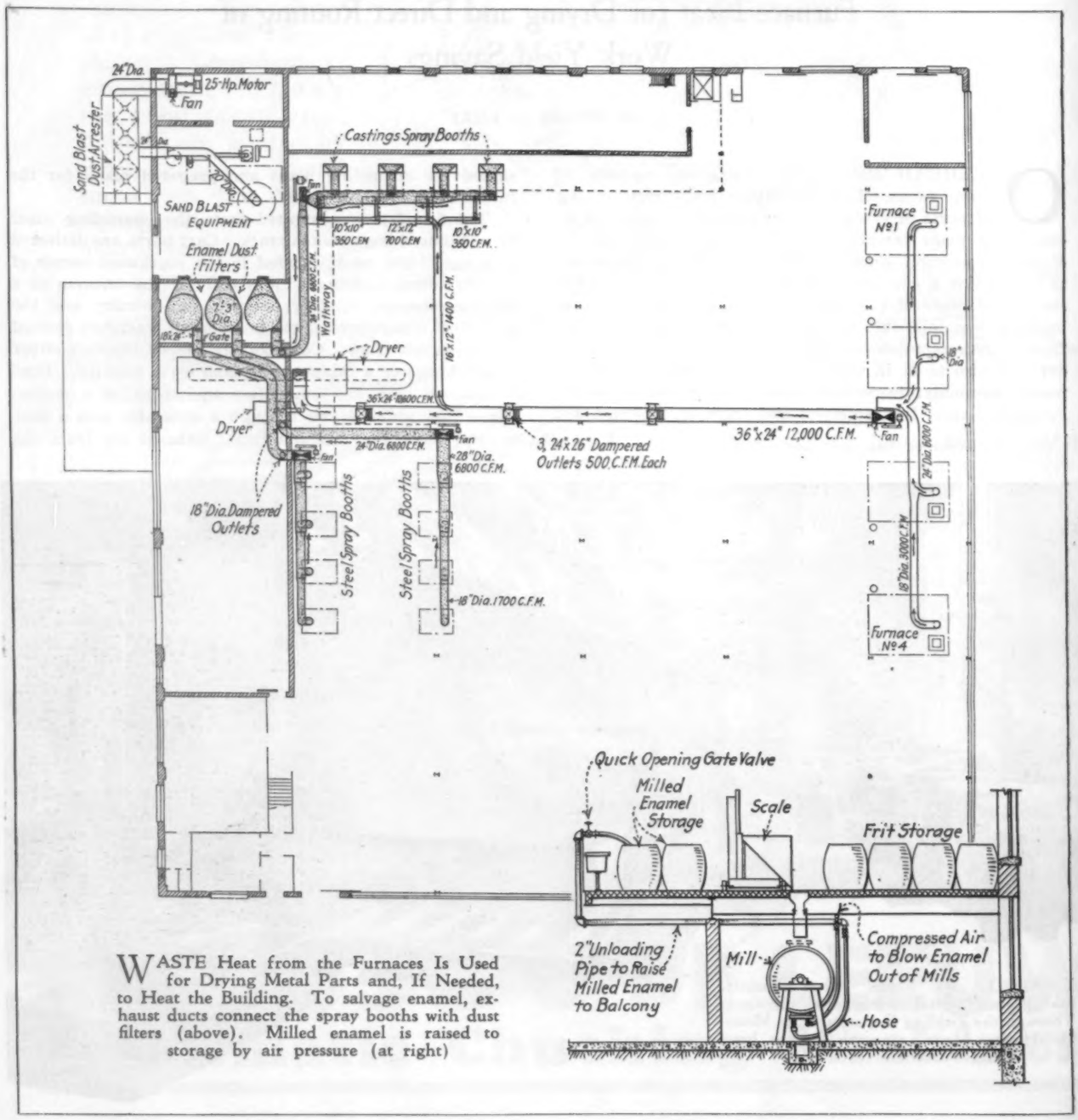
Enamel Dryers Use Reclaimed Heat

Waste heat for the dryers, as well as for one in the pickle room and another serving a steel parts dip tank, is obtained from tile heat reclaimers, one of which is built into each of four gas-heated burning furnaces. Air is drawn through the heat reclaimers and is distributed through an overhead duct system by a motor-driven fan.

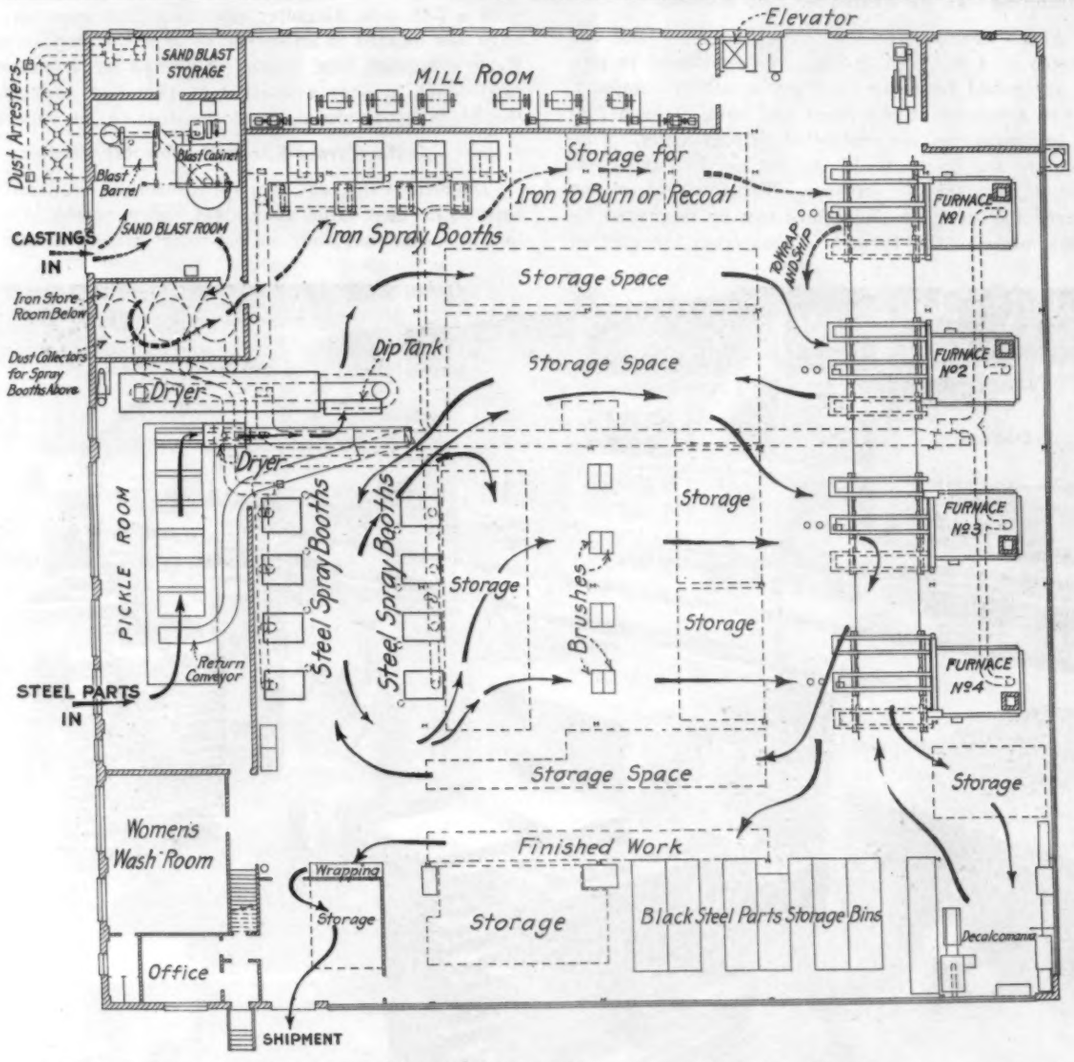
From the spray booths the coated castings are trucked in a straight line to a storage space, and from there to the No. 1 furnace. Castings are doubled back if second or third coats are specified. Finished castings pass down a wide aisle in front of the furnaces to finished parts storage. This is a temporary allotment of floor space, which will be used for this purpose until a finished parts storeroom is erected adjacent to a future assembly department.

Conveying Equipment Features Pickling, Dipping and Drying of Steel Parts

Pressed steel parts, now trucked from the old plant, are delivered to the pickle room. Plans for the future call for the erection of a steel parts storage room adjacent to the pickle room. Beyond the storage room will be the pressed metal department, so that formed parts will travel a minimum distance in going to the pickle room.



WASTE Heat from the Furnaces Is Used for Drying Metal Parts and, If Needed, to Heat the Building. To salvage enamel, exhaust ducts connect the spray booths with dust filters (above). Milled enamel is raised to storage by air pressure (at right)



DIRECT Routing of Materials and Provision for Future Expansion Feature the Plant Layout. Dotted arrows show the course taken by castings; solid arrows indicate the routing of steel parts

Steel parts, after delivery in the pickle room, are cleaned and washed in tanks, which are set in a pit. The parts are loaded into monel-metal baskets or carriers, which are moved from one tank to another by an electric hoist operating on an I-beam track. At the aisle end of each tank are manual controls for the hoist motor. After having been passed through the last tank, the baskets are transferred by the hoist to a roller conveyor, which passes them through a dryer. The parts are then inserted into a ground coat dip tank.

As each basket is unloaded at the tank, it is switched to a gravity roller conveyor that extends back of the tanks to the first cleaner tank, where the basket is again loaded and the cycle is repeated. Hoods over the tanks are vented through the roof. Steam from a central power house is used in the tank coils.

Routing of Work Well Planned

After receiving a ground coat, the steel parts are carried by a continuous conveyor through another dryer. The dried parts are removed from the conveyor at a station opposite the dip tank. They are then placed on wooden frames tiered on wooden platforms, which are moved by hand-operated lift trucks to storage across the aisle, preparatory to burning in furnace No. 2. After the ground coat is burned the loaded platforms are moved back to storage, from which they are trucked to stations opposite a double line of steel spray booths. After the parts have been sprayed they are returned to storage in front of the No. 2 furnace. If the parts are to be brushed they are moved a short distance to an adjacent aisle, where four brushing stations are located. After brushing, the parts are moved one step nearer the furnaces to a "brushed-work-to-burn" storage space. Burned steel to recoat is taken from the furnaces to a storage space convenient to the steel spray booths. After recoating, the product is moved to storage space near the furnaces.

Finished parts are sent to the temporary finished parts storage. When a finished parts storage room is built between the enameling room and the future assembly department, routing in the enameling room will not be altered, because the finished parts will move into the storage room through a door that now serves the shipping floor space. Space now used to store finished and black steel parts will be added to the enameling department.

Steel that is to receive decalcomania is trucked to the

southeast corner of the room, where the transfers are applied. The steel is then burned, inspected and sent to finished work storage.

Building Can Be Heated by Two Methods

The furnace hearths are 5 ft. wide by 12 ft. long and each furnace is 4 ft. high inside. The fuel used is gas, which is purchased from the local public utility company. Burners are arranged at the front and back of each furnace and temperatures are controlled automatically. Fuel gas is compressed to 10 to 15 lb. per sq. in., and combustion is in atmospheric burners. Temperature of the air delivered by the heat reclaimers can be increased by connections made to the furnace stacks from the suction side of the system, allowing, when needed, a part of the direct products of combustion to be drawn into the system. The delivery duct to the various dryers is designed with outlets, so that the system can be used to heat the building should it be desired. Supplementary, however, to this system are a number of unit steam heaters. In summer, fans on these heaters are used to keep the air moving in the room, thus maintaining uniform humidity and assuring more certain results in the process of enameling.

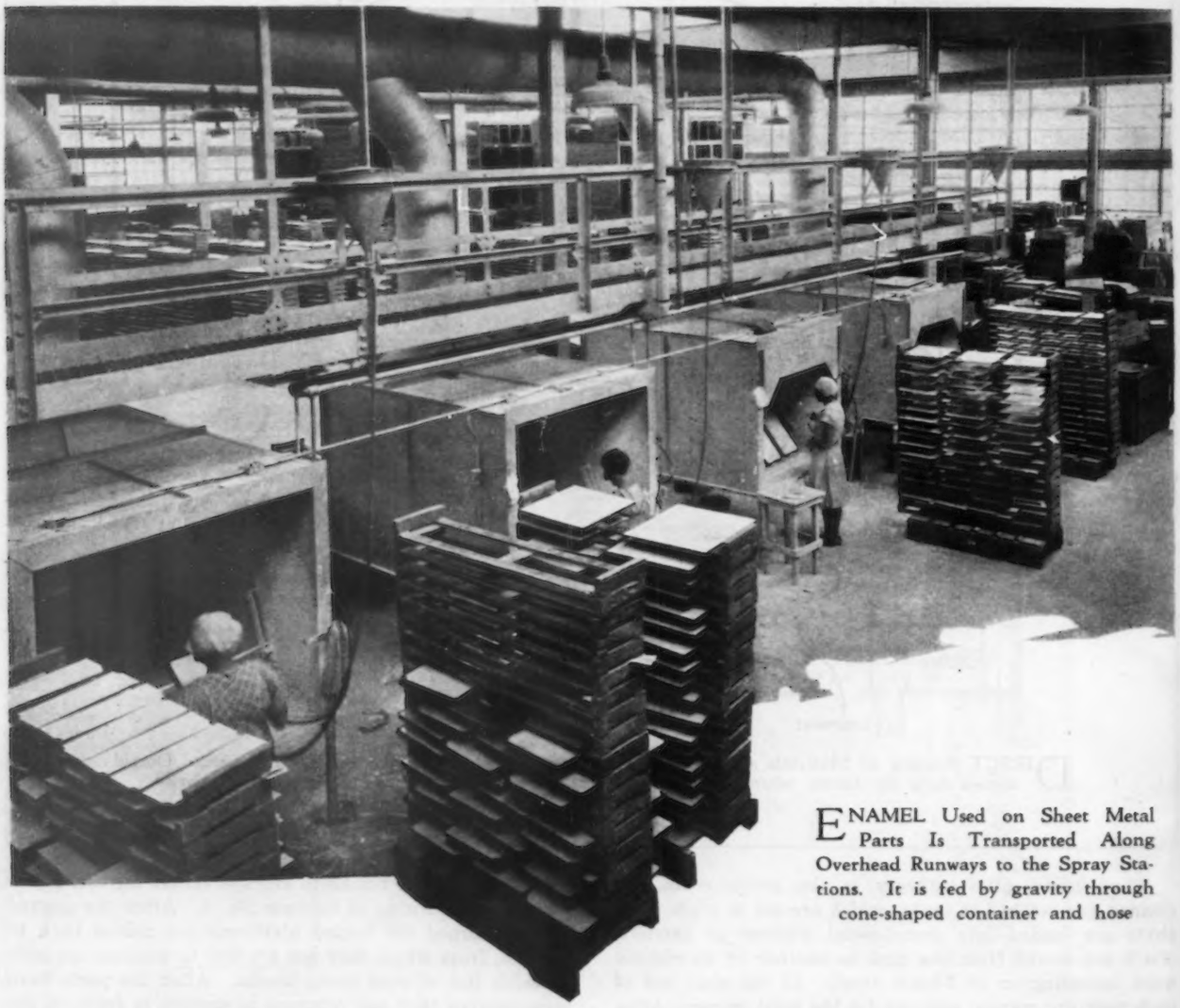
Double Charging Forks Serve Furnaces

A double charging fork is mounted in front of each furnace. Its frame moves on rails, so that one fork is always in front of the furnace door and the other fork is at one side, where it can be loaded. Pushing the carriage on its track and moving the forks in and out of the furnace are manual operations. In unloading and picking up a charge in the furnace, however, the forks are actuated by a pneumatic cylinder.

Connected with each spray booth is an exhaust duct. Each group of four booths is connected by a main duct with a 7-ft. 3-in. diameter cloth bag dust collector. These bags are located in an inclosure over the iron store room. Each group of four booths is served by a motor-driven fan, which creates a suction at the duct connections to the booth hoods and delivers the dust to the collectors.

Dust from Spray Booths Salvaged

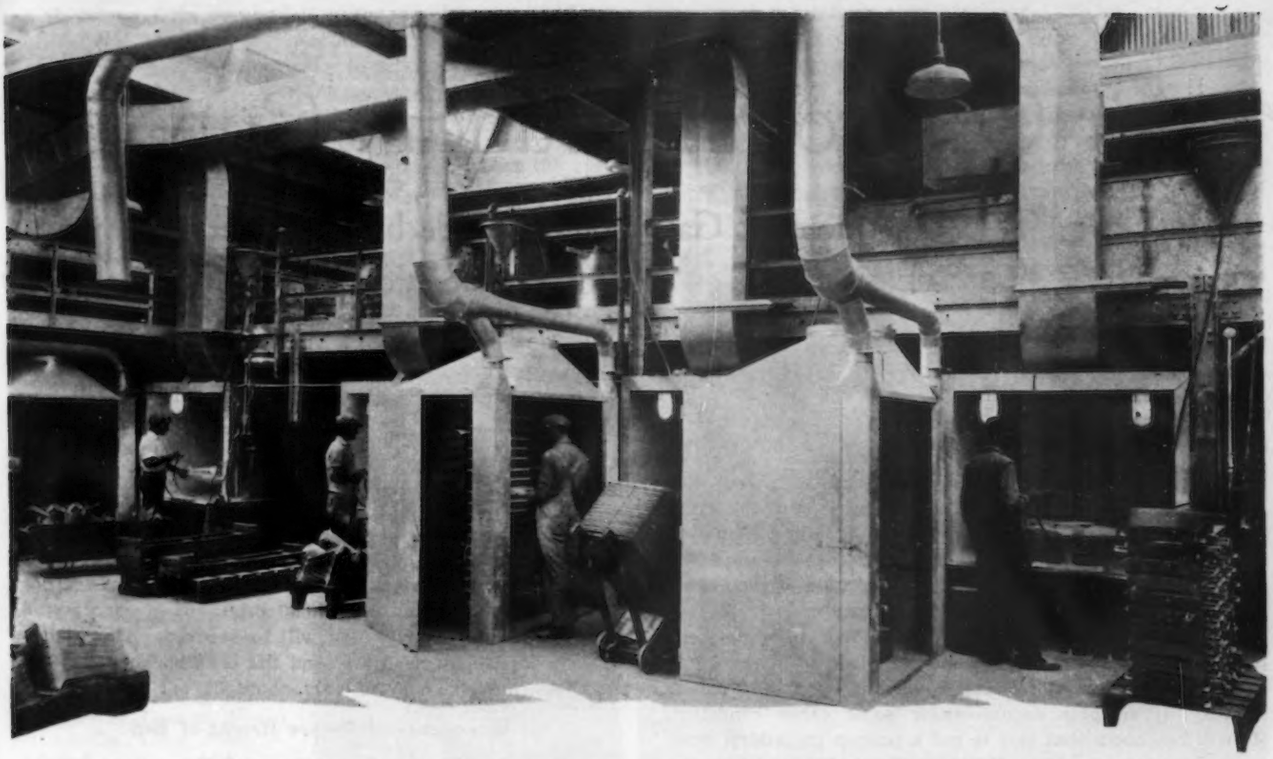
Dust from the cast iron spray booths is collected in one bag, white dust from four steel spray booths is collected in the second bag, and mixed-color dust is caught in the third bag, thereby salvaging the various kinds of enamel. Clean air from these filters is usually returned to the enameling room, but it may be discharged through skylight ventilators in the roof of the dust filter room.



ENAMEL Used on Sheet Metal Parts Is Transported Along Overhead Runways to the Spray Stations. It is fed by gravity through cone-shaped container and hose

Each brushing booth is covered with a hood, which is ventilated through the roof by an individual motor-driven fan. All booth tables are made of perforated steel and underneath are cone-shaped hoppers in which is reclaimed the heavy brushed enamel powder. These brushing booths are of the double-end type, giving in effect a double row of booths placed back to back.

Methods used in preparing and distributing enamel are unusual and effective. A mill room has been partitioned off along the north wall of the building. Enamel materials are delivered in railroad cars to the track on the north side of the room. Cars are unloaded on an electro-hydraulic elevator, which serves the mill room floor level

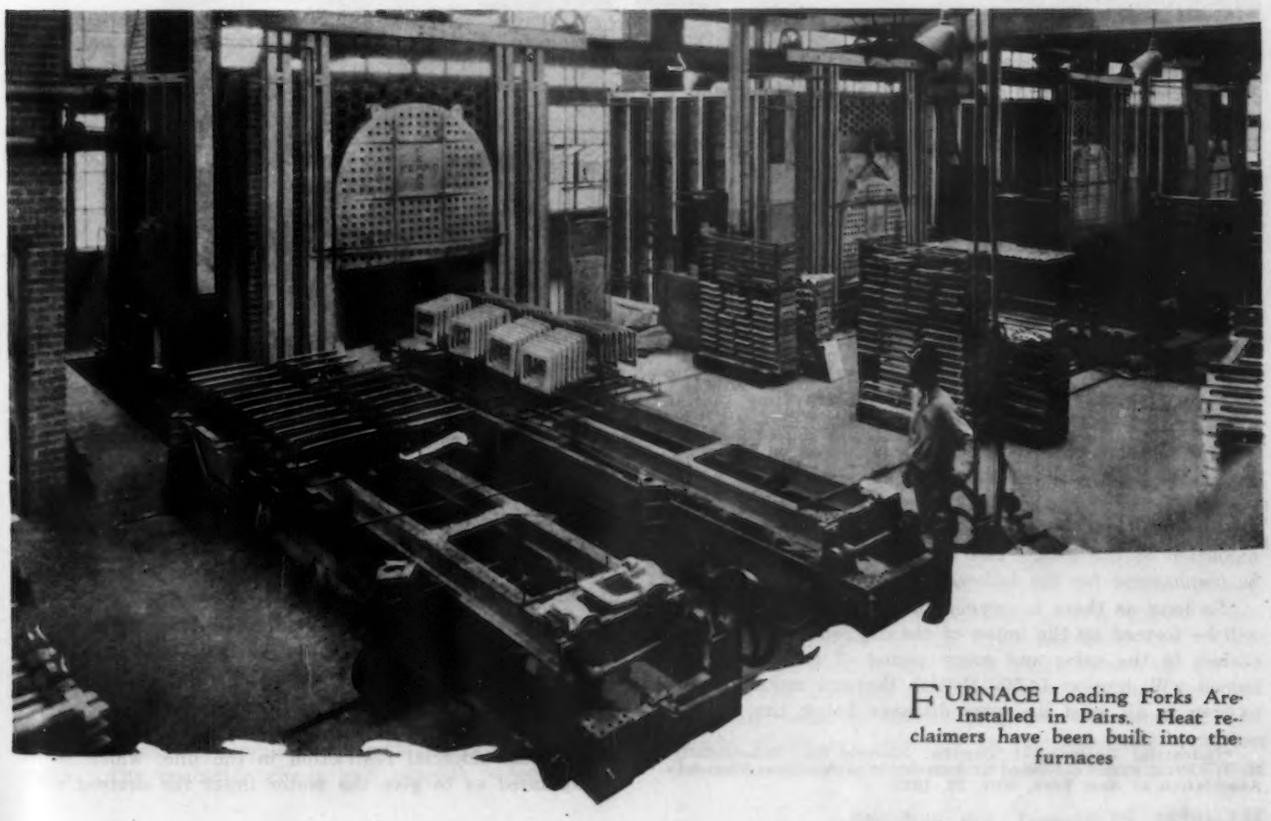


WASTE-HEAT Dryers Have Been Installed Adjacent to the Castings Spray Booths. Enamel is stored on the platform above

and also a balcony. Materials are lifted to the balcony and there stored until ready for mixing, which is done in a hopper scale. After having been proportioned, the dry mixture is spouted through the balcony floor to mills on the floor below.

Enamel for steel ground coating is poured from the mills into barrels and transported to the ground coat dipping tank. After the finish coat enamel has been prepared, the mills are put under air pressure, which forces the enamel into barrels located on the balcony.

An overhead walkway extends from the balcony over each line of spray booths. Attached to the walkway handrail above each booth is a cone-shaped container, to which is fastened a hose serving each spray gun. The enamel is thus fed by gravity. It is the duty of an attendant to keep the cone-shaped containers filled with enamel. This method removes the transport of enamel from the main floor.



FURNACE Loading Forks Are Installed in Pairs. Heat reclaimers have been built into the furnaces